Final
Cultural Landscape Report
Volume 1

Map and View
of the
ALLEGHANY MINING Co's PROPERTY
WARREN Co. N.J.
by
Montroville W. Dickeson, M.D.
1862.

ALLEGHANY

Pahaquarry Copper Mine
DELAWARE WATER GAP
National Recreation Area • New Jersey

Final
Cultural Landscape Report
Volume 1

August 1995

by
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Pahaquarry Copper Mine
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National Recreation Area • New Jersey

United States Department of the Interior • National Park Service • Denver Service Center

ACKNOWLEDGEMENTS

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PART I: MANAGEMENT SUMMARY

STUDY BOUNDARIES

This study includes the former site of copper mining and the 1925 Pahaquarra Boy Scout Camp in New Jersey, along the Delaware River, currently known as the Pahaquarry Copper Mine site. The original mining and later Boy Scout properties eventually reached some one thousand plus acres. This study is concentrated in about 200 acres on both sides of Mine Brook where most of the development history of the property is known to have occurred.

The Mine site is located on the New Jersey side in the southern end of the Delaware Water Gap National Recreation Area and is situated near the former site of Dimmick's Ferry eight miles above the Borough of Delaware Water Gap and twenty miles southwest or below Minisink island. It is about six miles southwest of Flatbrookville and is approximately two miles due north of Mt. Vernon. The area is located in Pahaquarry township of Warren County about one half mile from the southeast bank of the river and can be reached by the historic Old Mine Road.

For the purposes of historical documentation and evaluation of resource significance, the project includes all those properties and areas on which copper mining developed as well as the properties associated with the latter era of the Pahaquarra Boy Scout Camp.

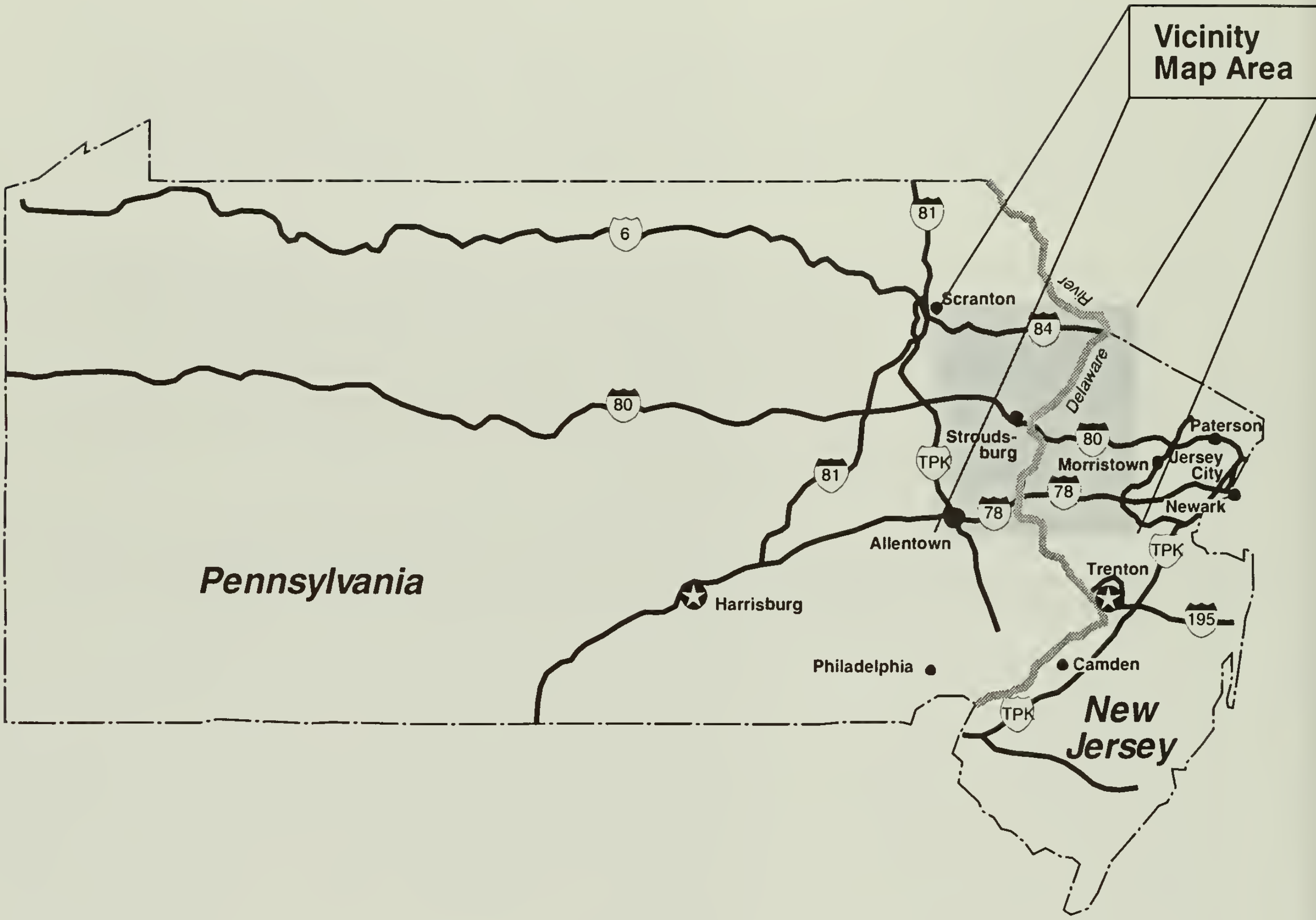


Illustration 1

LOCATION

Pahaquarry

Delaware Water Gap National Recreation Area

United States Department of the Interior National Park Service

DSC • 620 • 20050 • AUG 94

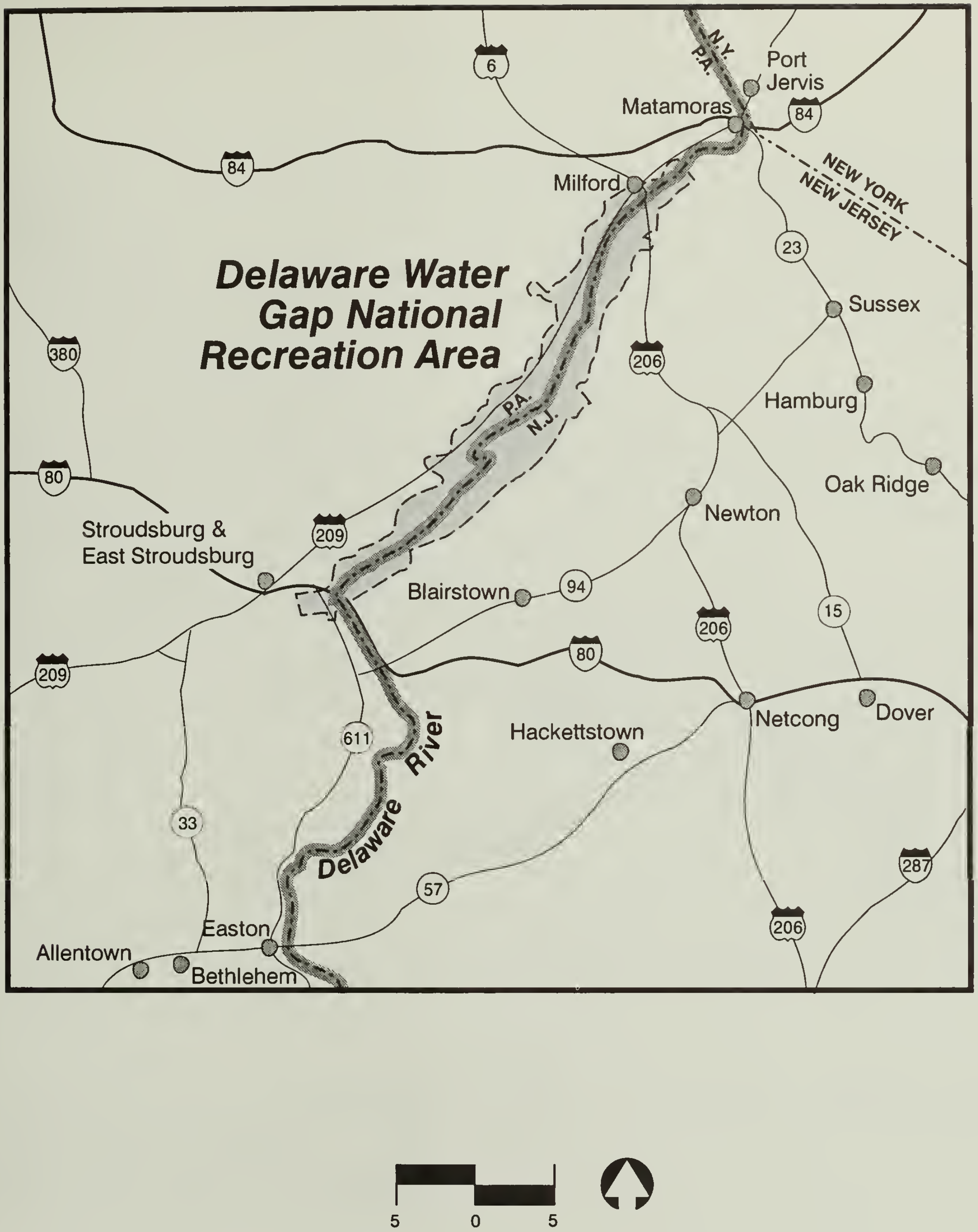


Illustration 2

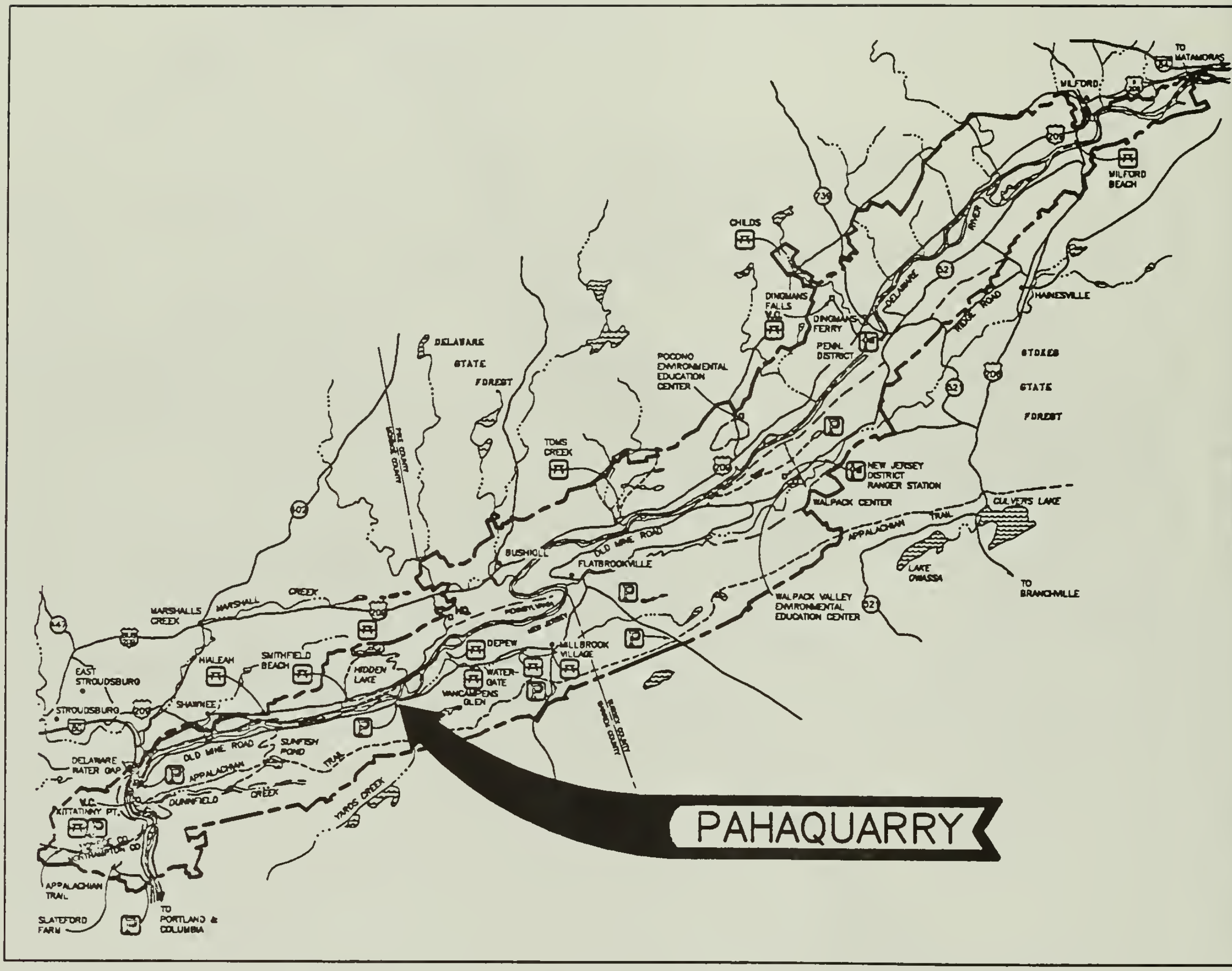
VICINITY MAP

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE

DSC • 620 • 20042 • FEB 94



NO SCALE

Illustration 3

SITE MAP

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

DSC • 620 • 25035 • FEB 94

PROJECT BACKGROUND

The General Management Plan (GMP) for the Delaware Water Gap identified resource management goals for the park as well as areas for development of recreational facilities. Pahaquarry was identified for a limited amount of facility development to accommodate visitor use and interpretation of the mine site. Specifically, the GMP has identified the need to "upgrade and expand the existing twelve car parking area to twenty-five, maintain three bus parking area, and install three toilet facilities." The park has also identified the need to provide interpretation of the site and to permit trail access to the Appalachian trail.

In addition, the GMP identifies the Pahaquarry Mine site as contributing to the Old Mine Road historic district. Although the site is currently listed in the National Register of Historic Places as contributing to the district, specific contributing features had not been identified. Neither had the site been evaluated to determine if it is individually eligible to the National Register.

No site planning has occurred beyond the GMP. There are no site resource documents that record the site's natural or cultural resources, although a number of evaluations of the mine have addressed its mineralogy and mine safety. In June 1992, stabilization recommendations were prepared by the Mining and Minerals Branch of the Land Resource Division of the National Park Service. Some of the Mine studies touched on the history of the site, however, it was usually cursory and incomplete. The site history was scattered throughout regional histories, park-wide resource studies, and original source material in the park files and other repositories. A single physical history had not been completed for the property.

This CLR provides a complete history of the site as well as an evaluation of National Register significance and integrity. It also provides a basis for facility development as identified in the GMP. Specifically, the CLR documents the history of the site, documents the existing conditions of the site, evaluates the significance, integrity, and character defining features of the landscape, and develops treatment alternatives to address site preservation and development needs.

The CLR serves as both a planning and design document for the site and functions as both a development concept plan and schematic design in its level of effort and detail for treatment and development.

HISTORICAL CONTEXT AND STATEMENT OF SIGNIFICANCE

The Pahaquarry copper mines of the Delaware Water Gap National Recreation Area fall within a regional context of copper exploration throughout the Appalachian Mountain area from Maine to Alabama that occurred from the eighteenth into the twentieth centuries. In the British colonial period, copper exploration occurred only at eight locations in two colonies – Connecticut and New Jersey. The Pahaquarry site, dating from the 1750s, is one of these locations and represent some of the oldest copper prospects in the eastern United States. In development order, it ranked as seventh of the eight British colonial sites.

The oldest of the eight British colonial sites, the Simsbury Mine of Granby Township, New Haven County, Connecticut, was chartered in 1707 and its tunnels and shafts were later used as an American Revolutionary War prison. Since 1972, at the time this mine was opened as a Connecticut state historic park, the Simsbury mine has been listed as a National Historic Landmark primarily for its association with the American Revolutionary War prison. Only the shafts and horizontal tunnels remain from the colonial mining period. Like Pahaquarry, this mine did not produce a profit. With dams, prospect holes, adits, and inclined shafts from the British colonial era, Pahaquarry remains as testimony to the search for copper during that period.[1]

The Pahaquarry site was also worked in 1829-30, 1847-48, 1861-62, and 1901-12. Thus, it is representative of the exploration for copper that occurred in the Appalachian region during three separate centuries, and, except for the Schuyler mine near Arlington, New Jersey, Pahaquarry has spanned a longer time period than any other copper area in the Eastern United States. Copper prospecting and mining occurred in the other Appalachian states during the nineteenth into the early twentieth centuries. Most of these ventures yielded little copper. Such mining proved to be profitable only in Vermont, Maryland, Tennessee, and the Schuyler and New Brunswick sites in eastern New Jersey. Thus, Pahaquarry is one of the last remaining examples of British Colonial copper exploration and the only site in the nation where the remains of five separate efforts over three centuries of exploration can still be seen. It is also typical of most of the copper explorations in this region which proved to be unprofitable. In addition, Pahaquarry is the only site in the nation with both above and below ground features from the era of British Colonial copper exploration. Consequently, it is the most complete example of British Colonial copper exploration in the country. Since no archeology has been done on the site, it is possible that the discovery of additional features from the mill and housing sites would further enhance this distinction.[2]

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1. "Old Newgate Prison and Copper Mine (Simsbury Mine)" National Historic Landmark form, January 4, 1972.

2. Walter Harvey Weed, "Copper Deposits of the Appalachian States," U.S. Geological Survey Bulletin 455 (Washington, D.C.: Government Printing Office, 1911) 18-33, 35-36, 42, 152.

In addition to representing the search for copper in the Appalachian region, the copper-bearing ore found at the Pahaquarry site has been accorded a scientific distinction by geologists. These professionals have classified Appalachian copper deposits into six types. One of those six types has been termed the Pahaquarry Type in recognition of the ore found at the New Jersey site.[3]

Although later adapted for a Boy Scout camp, the vestiges from exploration at Pahaquarry are significant because of their association with copper prospecting activity that occurred over three centuries in the Appalachian Mountain region. They depict technological innovation as mining practices evolved from primitive extraction and milling methods of the eighteenth century to turn-of-the-twentieth-century open pit quarrying and concentration processes. As exemplary of the first era of development in the 1750s, mining techniques comprised the use of simple iron tools, black powder, and a water-powered stamp mill. In the periods of 1847-48 and 1861-62, techniques had advanced to permit the use of steel implements and safety fuses. The final mining epoch in 1901-12 was epitomized by open pit mining combined first with an experimental method of refining followed by one of the earliest flotation concentration methods to be used in the United States, and finally by an older roasting and leaching process. Under the National Register of Historic Places Criterion A, the Pahaquarry mines represent a broad pattern of the history of man's search for valuable minerals and the measures taken to extract and refine that ore. Under Criterion C, the distinctive human activity and occupancy associated with these prospecting developments and operation periods have modified the natural features with tangible traces and remains that define a historic landscape. Although many above-ground traces of exploration era buildings have been removed, the site still contains evidence of landscape patterns and features of four prospecting periods such as patterns of spatial organization and land use, response to natural features, cultural traditions, circulation networks, boundaries, and buildings and structures. As a result, significant remains exist from the various exploration period landscapes to present a picture of the Pahaquarry mining operations. Under Criterion D the mining property has archeological significance because it contains physical remains in the form of waste dumps, building foundations, machine pads, dams, utility systems, walls, privy pits, possible eighteenth century mill site, collapsed tipple, as well as roads and trails that can yield further information about the site history, operation, organization in the landscape, and cast light on social, economic, and cultural facets of copper prospecting during three centuries.

The enduring components of the Pahaquarry copper site evoke a feeling and association with a historic mining landscape that has evolved over five distinct prospecting operations from the eighteenth into the twentieth centuries. This situation, representing distinct periods of copper exploration in a compact site, is unique to the National Park Service and the nation. Although the Pahaquarry adits, shafts, and quarry fall within a regional context of Appalachian Mountain copper exploration, the National Register of Historic Places has no provision for regional significance, consequently, the Pahaquarry copper site can be considered to have national significance.

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3. Weed, "Copper Deposits of the Appalachian States," 10-11, 13.

After the Trenton Council of the Boy Scouts of America purchased the property in 1925, that chapter adapted many of the previous mining era buildings for their purposes. Consequently, a Boy Scout layer is present on the cultural landscape of the mining property, but it has been greatly diminished because the United States Army Corps of Engineers removed much of the evidence of that presence during the early 1970s. As a result, the character-defining features remaining from the copper prospecting eras dominate the site and its significance.

HISTORICAL SYNOPSIS

Considerable periods of activity, from exploration for copper, lumbering, and the Boy Scouts, have taken place on the Pahaquarry site. Each era has left its mark on the land, but the quest for copper ore, during five periods across three centuries, stands out as the most notable activity. It represents the pursuit of profit from mining in the Appalachian area during the British colonial period to the early twentieth century and, as is often the case in the speculative industry of mining, Pahaquarry never proved profitable. Over the span of 160 years, mining technology changed to reflect differing uses and organization of the site, social relationships were reordered to form a greater hierarchical division between management and labor, and company organizations shifted from partnership to corporation.

Despite a legend that the Dutch had mined copper at Pahaquarry as early as the 1650s, no documented evidence has ever been found to confirm this tale which appears to have begun with an errant history published in 1828. Instead, the earliest corroboration of the search for copper at the site can be found in documents dating from the 1750s. During that period, John Reading, Jr., Martin Ryerson, and Anthony Maxwell formed a partnership to exploit the copper resource found at Pahaquarry. After obtaining an initial forty acre lot in 1753 followed by several more tracts of land by 1755, these men assembled a workforce to explore for copper ore. Using simple colonial technology, several prospect holes and an adit were dug on the northeast side of Mine Brook before excavation occurred at two adits and two inclined shafts on the opposite side of that waterway. In addition the partners constructed a stamp mill, the source of power for which came from water stored behind two dams on Mine Brook that was diverted through a race. Prospect holes, adits, inclined shafts, and dams still remain from this era. Future archeological surveys will undoubtedly provide further evidence of mining activity in this period. The collective remains of these works leaves a considerable testimony to the extraordinary effort of this early period. Mining operations undoubtedly proved unprofitable and ceased by 1760.

After the Pahaquarry site was abandoned by 1760, only sporadic mention was made of it during the next sixty-two years. A brief interest in copper developed in the 1829-34 period, but little activity seemingly occurred there beyond perhaps the recovery of mineral samples for assay. By the 1840s, increased copper prices combined with the discovery of copper in the Upper Peninsula of Michigan spurred a general interest in copper exploration. This situation undoubtedly explained the reason why, in 1847, six men formed a corporation that they named the Alleghany Mining Company and continued the quest to develop a profitable copper operation. After extensive prospecting with better mining technology, work ceased because the poor copper content of the low-grade ore defied a profit. Company directors, however, as was typical of speculative mining investment of the time, continued for a time with stock sales as a source of earnings.

As copper prices rose at the onset of the Civil War, the Alleghany directors took advantage of this situation and sold their company in 1861. The new board of directors proceeded to develop the site, produce promotional literature, and sell stock, but, as in the past, profit eluded them.

After an interlude of exploiting oak and hemlock trees for their bark to operate a tannery and general timbering, a group of resolute men, led by Henry and Oliver Deshler, sought their fortune at the Pahaquarry site during rising copper prices in the early twentieth century. These men appeared to be convinced of the possibilities offered by the industrial age. Modern technology permitted extensive site development complete with two experimental approaches for copper concentration. After developing a new adit, this corporation erected a 200-ton mill, office with laboratory, residence, blacksmith shop, oil house, barn, ice house, boarding house, powder house, a 2,500 foot long, double-track gravity tramway that led from a tipple near their quarry to a 1,000-ton ore bin above the mill, several dams, a pumphouse, and a 13,000 gallon water tank.

The Deshlers first experimental concentration method involved a process developed by Dr. Nathaniel Shepard Keith, a noted metallurgist and consultant to Thomas Edison. It involved passing pulverized ore mixed with coal through a flame. When this procedure failed, the Deshlers installed one of the nation's first experimental flotation methods in their mill. With the failure of this technique, they adapted their mill for an older concentration process to permit roasting and leaching of the ore. In the end, this method, too, failed and the company entered bankruptcy.

Oliver Deshler and his son Harry managed to recover the Pahaquarry land in the 1920-22 period. They converted the mill for a saw mill operation to manufacture railroad ties. These Deshlers also constructed a brick building next to the old blacksmith shop for the production of barrel staves. Timber for the operation came from the property. Failure to make mortgage payments caused them to lose the land.

In 1925, the Trenton Council of the Boy Scouts of America purchased the property which they named Camp Pahaquarra. The Boy Scouts adapted many of the earlier mining buildings for their own purposes and operated the camp until 1970. In that year the United States Army Corps of Engineers purchased the land. Soon thereafter, the corps removed the Boy Scout structures and the remaining mining era buildings in preparation for the Tocks Island Dam construction.

METHODOLOGY AND SCOPE OF PROJECT

The Pahaquarry Copper Mine site is currently managed by the NPS as a limited day use site. Visitors, who are familiar with the story of the copper mines, hike the trails around the site and visit the mine ruins and tunnels. Other visitors access the Appalachian trail from here. Ranger guided walks through the mine tunnels were provided until 1989. At that time, it was determined that the mine tunnels were unsafe and they were barricaded. No developed facilities exist on the site and the park has no active program for the preservation of the mine ruins.

The CLR will provide the direction for preservation treatment and facility development of this historic resource. It also will evaluate and document the significance, integrity, character- defining features, and existing condition of the resource.

The document is divided into five basic parts. Part one, of which this section is a part, is the management summary which outlines the study and the nature of the resource. Parts two, three, four and five provide the historical documentation and significance evaluation, existing condition documentation, character-defining feature analysis, and treatment alternatives.

Part 2, the historical documentation section, provides both the historic context of the site and the physical history of the property. The historic context establishes the relationship of the Pahaquarry site within the context of copper mining during the colonial era, mid-nineteenth, and early twentieth century and within the relevant geographical area of influence or trends within the historic development of mining.

The physical history documentation establishes, to the extent possible, the evolution through time of the mine site and the landscape patterns and features associated with each period of development.

Part 3 documents the existing condition of the site by looking at cultural patterns and features of the landscape and identifying the period from which they date and the current condition, or evidence of these landscape patterns and features. Documentation was done during field investigations and using current topographic mapping, aerial photography, and photography. Field documentation and the focus of the documentation effort was conducted for a small area of the original mining properties as shown in the area covered by figures 5A, 5B, 5C, 5D, and 6A, 6B, 6C, 6D. This area covers about one tenth of the original property on both sides of Mine Brook where copper exploration was known to have occurred and extant remains exist. It is possible that sites and remains of the mining activity which occurred on the property exist outside the area of field documentation and concentration for this documentation. Historical research, however, suggests that copper exploration during the mining periods occurred in the smaller area of focus which our efforts were concentrated.

The field investigation was conducted on April 14-15, 1993 by DSC historical landscape architect Steve Burns, historian Berle Clemensen and archeologist Paul Inashima, and on September 21-24, 1993 with the above authors of this report and archeologist John Wright

and landscape architect Wendy Davidson. A final field investigation was made on June 2, 1994 by the authors.

Part 4 of the CLR provides an analysis of the character-defining features of the landscape based on an understanding of the history of the site and existing conditions documented in the previous sections. National Register criteria are used to evaluate the integrity of the site, and to establish character-defining features of the landscape for the mining periods.

Part 5 of the CLR synthesizes the understanding of the historic landscape from the previous sections to develop treatment alternatives for the proposed site development, interpretation, and preservation of the historic landscape. The alternatives consider the range of treatments possible within the parameters of the four types of treatments identified in NPS 28 (release 4) for treatment of cultural landscapes. Within the treatment type selected for the landscape, alternatives are developed which address the proposed development program for the site, management issues, interpretation, and preservation.

RELATED PLANNING DOCUMENTS

The GMP is the only NPS planning document which has been completed that addresses the Pahaquarry mine site. No site specific resource documentation or analysis was done for the mine site as part of the GMP. It does, however, establish the relationship of the Pahaquarry Mine with other sites and resources within the park and identifies the level of development for the site.

Six studies have been done on the site that are worth mentioning. One is an engineering analysis, mentioned previously, entitled "Delaware Water Gap National Recreation Area Pahaquarry Copper Mine Site Abandoned Mine Stabilization Evaluation and Recommendations." This study was done by the NPS Land Resources Division, Mining and Minerals Branch to evaluate safety issues and related mitigation costs for preservation and interpretive use of the mine. As a result of this study, an effort was completed concurrent with this CLR to design and construct security and safety systems for the mine adits and inclines under agreement with the United States Bureau of Mines. This study is included in Appendix H,

The third study, an archeological investigation, was conducted in September 1992. This study evaluated the potential for archeological resources within the vicinity of two proposed parking locations that the park had identified as part of the facility improvements for the mine site. The report is included as an appendix to this document.

Two other studies, a vegetation analysis and mapping and an investigation of rare or endangered species, are included in Appendices I and J respectively. The last study, which should be mentioned, is a floodplain analysis of the site prepared for the NPS by Coastal Environmental Services Incorporated in August 1994. It is not included as an appendix.

RECOMMENDED ADDITIONAL RESEARCH

Time did not permit an exhaustive investigation of the Pahaquarry mining eras. As a result, questions pertaining to topics of direct and indirect relevance to the Pahaquarry mining periods are listed for future research.

1) Little is known of Samuel Neville and Richard Salter's motives for purchasing adjacent land to the Pahaquarry operation in the mid-eighteenth century. Neville, a prominent individual in colonial New Jersey society, obtained farm land elsewhere in the Upper Delaware Valley for speculation. The land contiguous with the Pahaquarry copper property, that Neville and Salter procured, was not farmland and, therefore, these two men could have obtained their tracts for either copper speculation or mining. Neville's forty acre tract is particularly curious since it is on a slope and ravine similar to the Mine Brook area and at forty acres is similar to John Reading's forty acre mine tract. Further research on Neville and Salter could reveal their intent for this land.

2) The Pre-1845 Land Survey Map labels a forty acre tract, that is contiguous with the Salter 532 acre property on the north, as a "mine lot." Deeds going back to the mid-1840s did not mention mines or mining on this property, but it would be interesting to do further research on the tract to see if mining did occur at this location as well.

3) Ryerson family papers are located at Rutgers University library. Perhaps these papers contain more information on the mid-eighteenth century copper operation at Pahaquarry.

4) Repositories in Philadelphia may contain material on the Godley family and the Alleghany Mining Company with which that family was associated from 1861-1901. These same libraries and archives may also have information on another Philadelphia resident, Montroville Wilson Dickeson, who produced promotional literature on the Pahaquarry copper operation in the 1861-62 period.

5) Research in the New Jersey State Library in Trenton in the Court of Chancery records on sheriffs' sales may yield descriptions of the Pahaquarry land and possible buildings located there.

6) The United States Army Corps of Engineers supposedly photographed the buildings at the Pahaquarry site before they were removed. A check with the corps office in Philadelphia indicated that they may have photographs, but such photos are kept in storage in unlabeled boxes. Thus, a search of these boxes would be time consuming, but could yield valuable information.

7) A barber shop in Columbia, New Jersey purportedly has photographs of the 1901-12 mining period buildings hanging on its walls. This potential source could be checked.

8) Manufacturers often provided detailed drawings for sales or installation of equipment their clients. This may have been the case for the twentieth century Pahaquarry Mining Company. Consequently, historical societies could be checked for manufacturers' catalogues or drawings for mining equipment used at Pahaquarry.

9) An archeological investigation could be conducted on the mining remains from the colonial era and other mining periods including exploratory shafts that are partly filled with debris. At the same time, the stone work located just north of the Poxono Boat Launch parking area, as seen in Figure 6D, photo 18, should be examined. It could be related to the mid- eighteenth century buildings that the mining partnership had on a two-acre parcel that fronted on the Delaware River.

10) Mining experts should examine the prospects to see if they can date them. At the same time, they could inspect the face of the outcropping on the Reading forty acre mine lot to determine if a disturbed area on that tract is a prospect.

11) The entire area of mining property should be checked for evidence of prospecting activity since only a small area of the 7.5 acre, forty acre, and twenty-four acre lots near Mine Brook were field examined for this report.

12) The Totts Gap area could be inspected for evidence of the Montgomery Gold Leaf Mining Company shaft located in that area. If found, it could prove to be the shaft shown in Historic Photos 36 and 37. These photographs could also have been taken at other areas of the mine property not field investigated for this report.

13) Photographs of the mining area were printed in a now defunct newspaper, *The Newark Sunday Call*, in 1933 or 1934. Perhaps a repository has acquired these pictures and others that were connected with the story but never printed. The N. S. Keith article "The Copper Deposits of New Jersey," in the *Mining Magazine* issue of June 1906 contains Pahaquarry photographs. That magazine may have an archive that contains other pictures of the mining area that were never printed. Photographs, contained in the United States Bureau of Mines report on Pahaquarry of August 1992, regional file No. 286, were not clear. That agency could be contacted for better prints on the mill foundations and standing tipple building.

PART II:
HISTORICAL DOCUMENTATION

HISTORIC CONTEXT OF THE PAHAQUARRY COPPER MINES

The Pahaquarry copper mines fall within a regional context of copper exploration throughout the Appalachian Mountain area from Maine to Alabama that occurred from the eighteenth into the twentieth centuries (Illustration 4). They represent some of the oldest copper deposits to be prospected in the eastern United States, and, except for the Schuyler copper mine near Arlington, New Jersey, the American Mine near Somerville, New Jersey, and the Griggstown Mine near Griggstown, New Jersey, Pahaquarry has spanned a longer time period than any other copper area in the Eastern United States. In the British colonial period, copper mining occurred at only eight locations in two colonies – Connecticut and New Jersey. Pahaquarry ranked in order as the seventh of the eight British colonial sites.

The oldest copper prospect in the eastern United States, the Simsbury Mine, is located in Granby Township of New Haven County, Connecticut (No. 10 on Illustration 4). The mining company was chartered in 1707. This operation lasted for only a short span of years and proved to be unprofitable. Later, its shafts and tunnels were later used as an American Revolutionary War prison for British soldiers. Today, its prison remains, shafts, and horizontal tunnels are part of a Connecticut state historic park. Since 1972, the Simsbury mine has been listed as a National Historic Landmark primarily for its association with the American Revolutionary War prison. Only the shafts and tunnels remain from this colonial copper venture.

The Simsbury operation was followed in 1719 by Arent Schuyler's opening of a copper mine near Arlington, New Jersey on the left bank of the Passaic River about seven miles from Jersey City (No. 15 on Illustration 4). Schuyler had purchased the property in 1710. The earliest operations at the Schuyler Mine amounted to strip mining, but this working soon evolved into a number of shafts. After a fire in 1768 burned the engine house and steam engine used to dewater the mines, the mine ceased to operate. It opened once more in 1793 and mining occurred for several years, but the work stopped because the copper yield lessened. The mine was re-worked in 1825, the mid-1830s, 1846-48, 1855-56, 1862-63, 1892-93, and finally in the 1900-1901 period. At various times during these mining periods, as many as thirty-two shafts were sunk, several underground rooms were excavated, an adit was dug for some distance from the slope of the hill, and, in the later days, a drainage tunnel was installed to conduct water from the mines. The Victoria shaft, named for Queen Victoria by the English concern that owned the mine during the 1830s, was the deepest at reportedly 347 feet, but the area below 240 feet became filled with mud. In the 1906-07 period, the east face of the hill was worked as a sandstone quarry for building materials. No surface remains exist at this once extensive mining site. Many of the shafts have been filled, while others have collapsed. The latest subsidence occurred in November 1989 along the drainage tunnel at the site of the Victoria shaft.

As a result of Arent Schuyler's copper discovery, other individuals began to prospect for this ore. Consequently, three adjoining mines opened in the 1720s in East Orange, New Jersey. The operations included the Dod Mine, Glen Ridge Mine, and the Wigwam Brook Mine. They were worked sporadically between the 1720s and the 1760s with little return on the investment. No surface trace remains of these mines.

Like the East Orange mines, the owners of the American (Bridgwater) Mine, about three miles north of Somerville, New Jersey, did some surface prospecting in the 1720s (number 17 on Illustration 4). Native copper, found on the surface, led to the development of several, small prospect adits, but the miners did not find copper in any quantity. Most mining occurred at this location in the 1820s, 1830s, 1881-83, 1898-1905, and 1907-09 periods. Underground workings during the 1880s and the turn-of-the-twentieth century became almost extensive as the Schuyler Mine. Dumps and a mine entrance exist from the later mining efforts.

By 1751, Elias Boudinot developed a copper mine near New Brunswick, New Jersey. It operated until 1770. No mining occurred at this site after that date. Although a significant amount of mining activity occurred at this location, the number of shafts has never been determined. As many as three shafts have been filled with rock. No extant surface remains exist. Much of this site contains buildings of a later Johnson and Johnson Company plant.

The final British colonial period copper investigation occurred in the 1753-60 period at Pahaquarry on the Delaware River in New Jersey and the Griggstown Mine (number 18 on Illustration 4) located one mile north of Griggstown, New Jersey. The Pahaquarry site was further probed in 1829-30, 1847-48, 1861-62, and 1901-1912, while the greatest working at Griggstown occurred in the early twentieth century. Some drifts and a dump remain from the later effort at Griggstown.

Appalachian copper ventures in the remaining states of Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, Maryland, Virginia, North Carolina, Georgia, Tennessee, and Alabama were prospected during the nineteenth to the early twentieth centuries. Most of these ventures, like Pahaquarry, produced little copper. Copper mining proved to be profitable only in Vermont, Maryland, Tennessee, the Schuyler site in eastern New Jersey, and, for a short period, at the New Brunswick mine.

Pahaquarry is one of the last remaining examples of British Colonial copper exploration and the only site in the nation where the remains of five separate efforts over three centuries of exploration can still be seen. It is also typical of most of the copper explorations in this region which proved to be unprofitable. In addition, it is the only site in the nation with both above and below ground features from the British Colonial copper exploration era. Consequently, it is the most complete example of British Colonial copper exploration in the country. Since no archeology has been done on the site, it is possible that the discovery of additional features from the mill and housing sites would further enhance this distinction.

In addition to representing the search for copper in the Appalachian region, the deposit found at the Pahaquarry site has been accorded a scientific distinction by geologists. These professionals have classified Appalachian copper deposits into six types. One of those six types has been termed the Pahaquarry Type in recognition of the ore found at that site in New Jersey. It is described as an ore that is found in low-grade deposits that occur either in gray or grayish to greenish cupriferous silurian sandstone located in red sandstone.

The various prospecting eras at Pahaquarry depict technological innovation as mining practices evolved from primitive extraction and milling methods of the eighteenth century

to turn-of-the-twentieth-century open pit quarrying and concentration processes. As exemplary of the first era of development in the 1750s, mining techniques comprised the use of simple, iron tools, black powder, and a water-powered stamp mill. In the periods of 1847-48 and 1861-62, techniques had advanced to permit the use of steel implements and safety fuses. The final mining epoch in 1901-12 was epitomized by open cut mining combined first with an experimental method of refining followed by one of the earliest flotation concentration methods to be used in the United States, and finally by an older roasting and leaching process.

After the Trenton Council of the Boy Scouts purchased the property in 1925, that chapter adapted many of the previous mining era buildings for its purposes. Consequently, a Boy Scout layer is present on the cultural landscape of the mining property, but it has been greatly diminished because the United States Army Corps of Engineers removed much of the evidence of that presence during the early 1970s. As a result, the character-defining features remaining from the copper prospecting eras dominate the site and its significance.

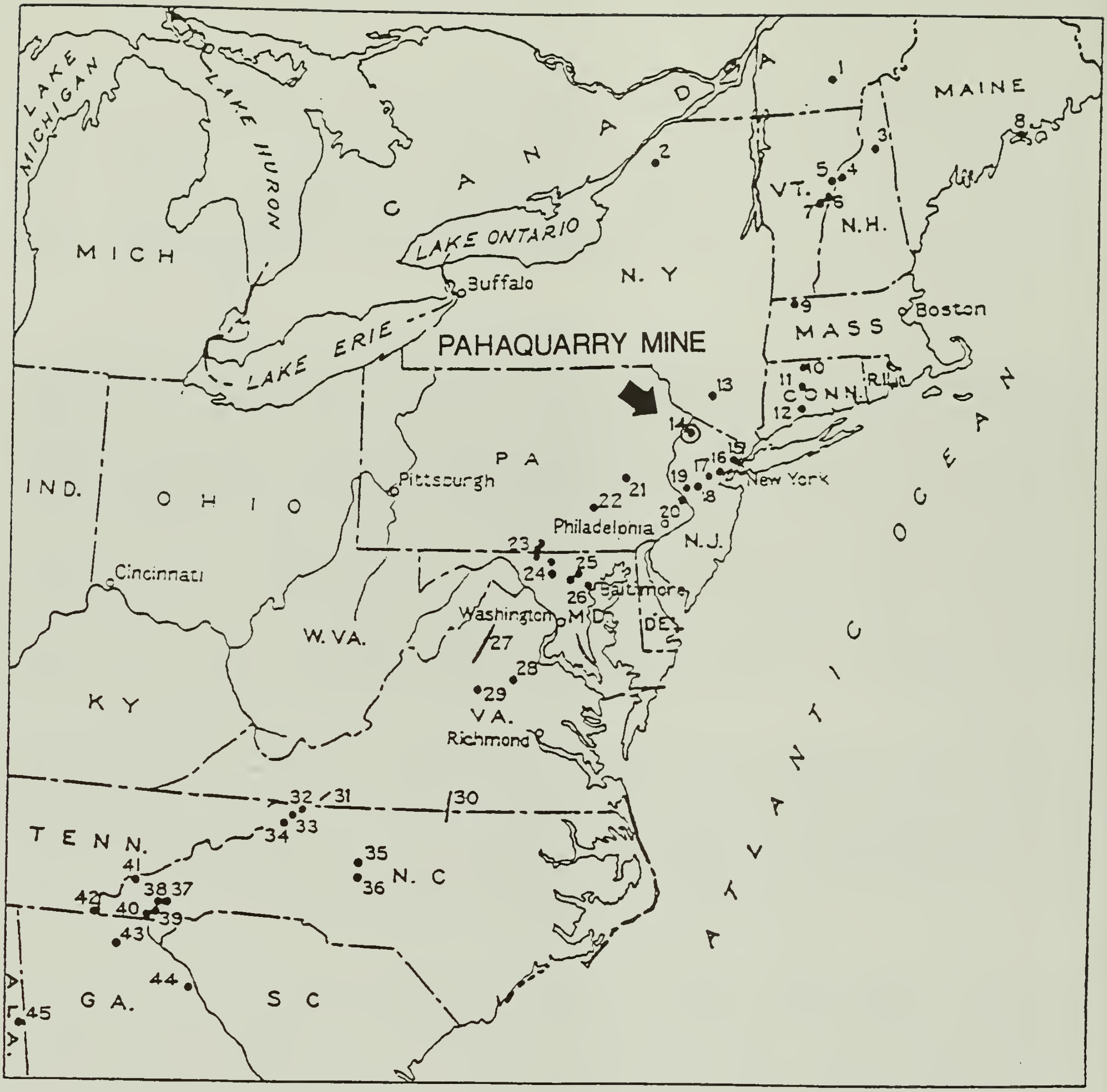

Illustration 4
Location of Copper Mining Areas Throughout the Appalachian Area

1. Capleton, Quebec
2. High Falls, New York
3. Milan Mine, New Hampshire
4. Gardners Mountain, New Hampshire
5. Corinth Mines, Vermont
6. Ely Mine, Vermont
7. Copperas Hill, Vermont
8. Blue Hill Mines, Maine
9. Davis Mine, Massachusetts
10. Simsbury Mine, Connecticut
11. Bristol Mine, Connecticut
12. Mount Carmel, Connecticut
13. Ellenville, New York
14. **Pahaquarry, New Jersey**
15. Schuyler Mine, New Jersey
16. Plainsfield, New Jersey
17. American Mine, New Jersey
18. Griggstown Mine, New Jersey
19. Flemington Mines, New Jersey
20. New Hope, Pennsylvania
21. Carpenter Mine, Pennsylvania
22. Cornwall Mine, Pennsylvania
23. Copper Prospects, Pennsylvania and Maryland
24. Western Belt, Maryland
25. Mineral Hill, Maryland
26. Bare Hills, Maryland
27. Blue Ridge, Virginia
28. Valzinco Mine, Virginia
29. Stony Point, Virginia
30. Virgilina, Virginia-North Carolina
31. Gossan Lead, Virginia
32. Peachbottom, N. Carolina
33. Ore Knob, N. Carolina
34. Elk Knob, N. Carolina
35. Conrad Hill, N. Carolina
36. Gold Hill, N. Carolina
37. Wayhutta, N. Carolina
38. Cullowhee, N. Carolina
39. Savannah, N. Carolina
40. Otto Mine, N. Carolina
41. Fontana, N. Carolina
42. Ducktown, Tennessee
43. Dahlonega, Georgia
44. Magruder, Georgia
45. Stone Hill, Alabama

PHYSICAL HISTORY OF THE PAHAQUARRY COPPER MINE SITE

PRE-EUROPEAN OCCUPATION

Archeologists have classified the pre-European occupation of the Upper Delaware Valley into three periods. Paleoindian habitation began about 10,700 years ago. These hunter/gatherer peoples tended to live in temporary camps where they used only very basic and general tools to sustain their nomadic existence. About 9,500 years ago Archaic man appeared. Although this population, too, existed by hunting, fishing, and foraging, it benefitted from the development of more refined tools. The third era, termed Woodland, began about 3,000 years ago. These people utilized the bow and arrow for hunting and fired clay vessels for cooking and storage pots. In the latter phase of this period, a more sedentary life developed which revolved around agriculture with the introduction of corn, beans, and squash, although the population still hunted wild game. At the time of European contact in the 1600s, the aboriginal inhabitants of the Upper Delaware River valley lived mostly in single-unit houses that were disbursed with no location pattern in unfortified villages. These people, known as the Minisink band of the Lenni Lenape (Delaware) tribe, farmed the level, cleared areas along the Delaware and augmented their diet with wild game, fish and shellfish, as well as the fruit, nuts, berries, and roots of wild plants. Consequently, evidence of native populations has been found in the Pahaquarry area, especially on the flat first terrace above the Delaware River. Some copper ornaments associated with Native Americans have been found at village sites and in graves, but these native copper decorative pieces had their origin in the Great Lakes area. The diffuse copper deposits at Pahaquarry prevented Native American exploitation of that resource.[4]

EUROPEAN SETTLEMENT

Based on Henry Hudson's 1609 explorations, the Dutch proclaimed a colony along the Hudson River. Their goal was to develop a commercial venture to obtain furs from the native population by trading such items as kettles, iron axes, and glass beads with them. In 1615, the first Dutch trading organization, the United New Netherland Company, made contact with the Minisink Indians when they erected a fort and trading post near Esopus (now Kingston, New York) at the mouth of the Rondout Creek on the Hudson River. Soon after that date, the Dutch undoubtedly used an existing Indian trail from Esopus to the Minisink Island area on the Delaware River for the purpose of broadening their commercial contacts with the Minisink. At the time, these Native Americans lived in significant numbers in the Minisink Island area in the upper end of the Upper Delaware River Valley (Illustration 5).[5]

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4. Richard J. Dent, "Archeology in the Upper Delaware Valley: The Earliest Populations," In David G. Orr and Douglas V. Campana, eds., *The People of Minisink: Papers from the 1989 Delaware Water Gap Symposium* (Philadelphia: National Park Service, Mid-Atlantic Region, 1991) 129,132-133; Herbert C. Kraft, "The Minisink Indians," In David G. Orr and Douglas V. Campana, eds., *The People of Minisink: Papers from the 1989 Delaware Water Gap Symposium*, 21-23, 29, 31, 33, 35, 37.

5. Donald H. McTernan, "The Esopus-Minisink Way: A Short History of the Region with an Examination of the Legend of the Old Mine Road" (Master's Thesis, State University of New York at Oneonta, 1969) 13.

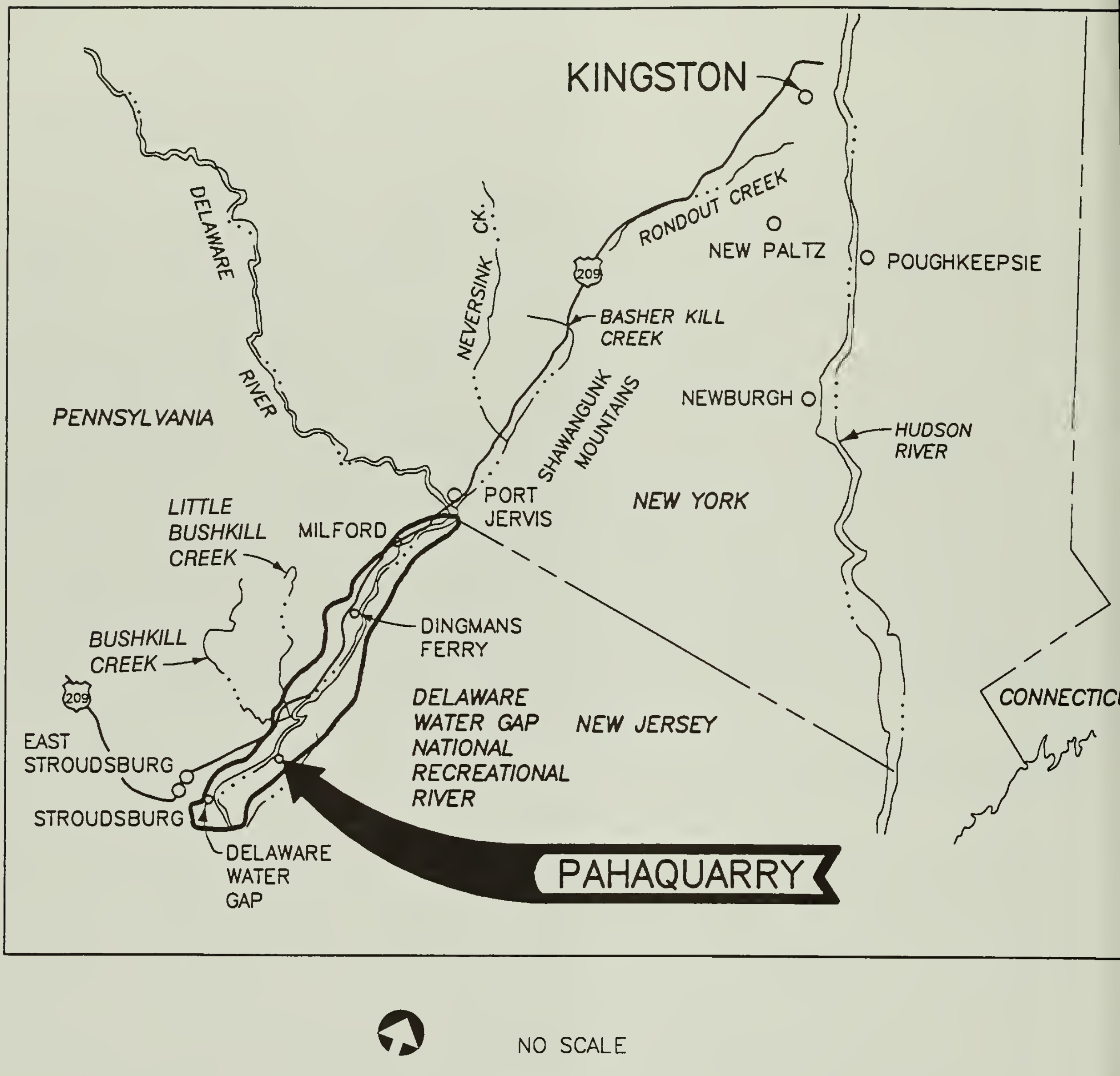

Illustration 5

REGIONAL MAP

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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Although the Dutch started a trading post near Esopus in 1615, no permanent settlement occurred there until 1652 when a half dozen farm families arrived there. During the 1640s into the 1660s, Dutch maltreatment of the Native Americans led to sporadic warfare. This situation restricted Dutch settlement to the immediate environs of Esopus. Slowly, however, families moved outward and settlement progressed down the Esopus-Minisink Trail toward the Upper Delaware Valley. Such a happenstance led the Dutch to become the first European settlers in that region. Although the first patent for 1,200 acres in the Minisink Island section of the Upper Delaware Valley was issued on October 14, 1697, a dispute among the partners of this venture prevented immediate settlement. As a result, the first recorded settler was William Tietsort, a blacksmith, who moved to the Minisink Island area in 1697 at the request of the Indians. He received a grant of 350 acres on June 3, 1700. Tietsort was followed in 1701 by a group of Dutch. In 1712, Solomon Davis was the first European to locate south of the Minisink Island area. He bought land on the New Jersey side of the Delaware River three miles south of that island.[6]

As white settlement occurred in the upper end of the Upper Delaware Valley, the Indians shifted their village sites to the lower end of that valley. In 1713, a treaty between the New Jersey proprietors and the Minisink/Shawnee brought an agreement by the Indian population to abandon the Upper Delaware Valley in the area of present-day Warren and part of Sussex counties. These people, however, did not immediately vacate the area. John Reading, Jr., a surveyor for the New Jersey proprietors, encountered an Indian village several miles above the Water Gap when he traversed the area in 1719. At the same time he observed that white settlement had not progressed southward from the Davis land and, thus, the Upper Delaware Valley was polarized with whites at one end and the Indians at the other extremity. It was not long before white encroachment began to extend southward. By March 8, 1732, Abraham Van Campen purchased 1,666 acres of land on the Pahaquarry Flat just north of the site of the future copper area.[7]

For the early Dutch settlers of the upper portion of the Upper Delaware Valley, a communication route to the outside world followed the old Esopus-Minisink Indian trail between the Minisink Island in the Delaware River to Esopus on the Hudson River. At first, the trail was nothing more than a footpath, but, by 1715, this passage had been improved into a road. Contrary to legend, as presented by Samuel Preston and subsequent authors, this early road was not built in the 1650s to accommodate Dutch miners at Pahaquarry. (Pahaquarry is a corruption of the Lenni Lenape word Pahoqualin which means end of the two mountains with stream between.) It was some years before this route extended southward along the Delaware River on the New Jersey side. In 1719, when John Reading, Jr. traveled the area northward from Pahaquarry Flat to the Minisink Island area, no road existed. After rough travel along the Delaware River bank on the New Jersey shore, Reading's party reached an Indian village just north of the Flat Brook. These people told Reading that the best route northward was located on the

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6. McTernan, "The Esopus-Minisink Way," 30, 38-41; Armand La Potin, "The Minisink Grant: Partnerships, Patents, and Processing Fees in Eighteenth Century New York" *New York History* 56(January 1975) 46; Marius Schoonmaker, *The History of Kingston, New York From Its Early Settlement to the Year 1820* (N.Y.: Burr Printing House, 1888) 3-11.

7. McTernan, "The Esopus-Minisink Way," 41, 49; J. H. French, *Gazetteer of the State of New York* (Syracuse: R. P. Smith, 1860) 503; Weaver and Kern, *Warren County History and Directory or The Farmers' Manual and Business Men's Guide* (Washington, N.J.: Press of the Review, 1886) 82.

opposite side of the river. Consequently, the Reading group crossed the river for the remainder of their journey to the Minisink Island area.[8]

DUTCH MINING AND THE "OLD MINE ROAD"

Since 1828, numerous writers have produced tales of Dutch miners who extracted copper ore from mines at Pahaquarry as early as the 1650s. These stories began with the publication of four letters by Samuel Preston, dated May 30, and June 6-20, in the July 12, 1828 edition of *Hazard's Register*. Preston wrote that, as a deputy surveyor in the employ of the state of Pennsylvania, under James Lukens, he had occasion to travel to the area above Delaware Water Gap in 1787. Before he departed for the Upper Delaware River Valley, his supervisor, James Lukens, supposedly told Preston of a similar journey he had made to the area in 1730 where he learned of an "Old Mine Road" over which early Dutch settlers hauled copper from mines at Pahaquarry. Writing some forty-eight years after the event, Preston's memory proved to be faulty. In the journal that he kept during his 1787 trip, Preston neither mentioned Dutch mines nor did he indicate that he had crossed the Delaware River into New Jersey. In addition, Lukens could not have visited the area in 1730, as Preston noted, because he was born on October 17, 1729. If Lukens had made such a trip, it would more likely have been in the 1750s. Preston stated that Lukens, at the time of his visit, had encountered Dutch settlers in the region above the Water Gap who communicated with the outside world by using the "Old Mine Road." This road, Preston wrote, extended some hundred miles from mine holes near "Paaquarry Flat" on the New Jersey side of the Delaware River to Esopus, New York on the Hudson River. Consequently, Preston recorded that Lukens instructed him to question the inhabitants about the background of the "Old Mine Road." The oldest residents, who Preston judged to be grandsons of the original settlers, could not supply a date for the road's construction. Instead, he claimed to have received a vague answer that in some previous time Dutch miners had built the road to haul ore to the Hudson River. Although not mentioned in his 1787 journal, Preston stated in his 1828 letters that he had traveled to see the mines. After supposedly viewing them, Preston could not assign a date to the road or mines. All he could determine was that a great amount of labor had been expended to dig the mine holes. Preston observed that by 1787 the mine entrances had caved and become overgrown with brush. Two years later, in the summer of 1789, two New York surveyors told him

8. McTernan, "The Esopus-Minisink Way," 108-114.

that the mines and road had been constructed by the Dutch before their colony had been conquered by the English in 1664.[9]

Following Preston's letters, succeeding authors investigated seventeenth century documents pertaining to the Dutch West India Company in an effort to substantiate the claim of Dutch mining at Pahaquarry and the "Old Mine Road" construction in the 1650s. Most early writers misinterpreted the Dutch records, while later authors copied the earlier mistakes. Thus began the legend of the "Old Mine Road" and the Dutch copper mine at Pahaquarry.[10]

The post-Preston writers' basis for proof of the Dutch knowledge of copper at Pahaquarry was contained in two 1659 letters exchanged between the Dutch West India Company commissioners in Holland and the New Netherlands governor Peter Stuyvesant. In April 1659, the commissioners wrote to Stuyvesant that they had seen a sample of "good and pure copper" which had been shipped from New Netherlands. Since the ore seemed to be valuable, the commissioners asked Stuyvesant to question Claes de Ruyter, a Dutch explorer, about its source which was purported to have been found in the colony's interior. Stuyvesant replied that Ruyter stated that the copper ore *did not come* from the South (Delaware) River, but had been obtained from a crystal mountain which lay between the Manhattans and the South River. Post-Preston authors, such as C. G. Hine and Amelia Stickney Decker, however, misread Ruyter's statement and proclaimed the source of the ore as copper mines in the Pahaquarry area of the Delaware River. To transport the ore

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9. Charles G. Hine, *The Old Mine Road* (New Brunswick: Rutgers University Press, 1963) 5-9. This book was first printed in 1909; Daniel I. Rupp, *History of Northampton, Lehigh, Monroe, Carbon, and Schuylkill Counties Containing a Brief History of Leading Events, Incidents, and Interesting Facts in the Early History of These Counties* (Harrisburg: Hickok and Cantine, Printers and Binders, 1845, Reprinted N.Y.: Arno Press and the New York Times, 1971) 161-162; Harry Bischoff Weiss and Grace M. Weiss, *The Old Copper Mines of New Jersey* (Trenton: The Past Times Press, 1963) 82-87; John T. Cunningham, *New Jersey: America's Main Road* (Garden City, N.Y.: Doubleday & Co., 1966; Ralph J. Leo and Edward S. Rutsch, "Cultural Resource Survey, Worthington State Forest, Pahaquarry Township, Warren County, New Jersey" (Newton, N.J.: Historic Conservation & Interpretation Inc., 1981) 83-84; Samuel Preston, "Extracts from the Journal of Samuel Preston, Surveyor, 1787," *The Pennsylvania Magazine of History and Biography* 22(1898) 350-365; Herbert C. Kraft, "The Historic Minisink Settlements: An Investigation into a Prehistoric and Early Historic Site in Sussex County, New Jersey" (Elizabeth, N.J.: Archaeo-Historic Research, 1975) 26.

10. Rupp, *History of Northampton, Lehigh, Monroe, Carbon, and Schuylkill Counties*, 161-162; James P. Snell, *History of Sussex and Warren Counties, New Jersey with Illustrations and Biographical Sketches of Its Prominent Men and Pioneers*, vol 2 (Philadelphia: Everts & Peck, 1881); George Wyckoff Cummins, *History of Warren County, New Jersey* (N.Y.: Lewis Publishing Co., 1911) 221-222; Henry Charlton Beck, *The Roads of Home: Lanes and Legends of New Jersey* (New Brunswick: Rutgers University Press, 1956) 8-9; Elizabeth G. C. Menzies, *Before the Waters: The Upper Delaware Valley* (New Brunswick: Rutgers University Press, 1966) 3-4; A. Van Doren Honeyman, ed., *Northwest New Jersey: A History of Somerset, Morris, Hunterdon, Warren, and Sussex Counties*, vol. 2 (N.Y.: Lewis Historical Publishing Co., 1927) 577; Cunningham, *New Jersey: America's Main Road*, 36; Patricia M. Valance, "Mining in the Minisink and the Old Mine Road," In Dennis N. Bertland, Patricia M. Valance, and Russell J. Woodling, *The Minisink: A Chronicle of One of America's First and Last Frontiers* (Milford, Pa.: Four County Task Force on the Tocks Island Dam Project, 1975) 37-38; Weiss and Weiss, *The Old Copper Mines of New Jersey*, 82-87.

for shipment to Holland, these writers concluded that the Dutch had built a road from Esopus on the Hudson River to the mines at Pahaquarry on the Delaware River.[11]

No documented evidence has been found to confirm the legend that the Dutch operated the Pahaquarry copper mines in the 1650s or constructed a 104 mile road from that location to the village of Esopus on the Hudson River. Most authors, who subscribed to the mining legend, had scant knowledge of copper or copper mining, especially the mining technology of the seventeenth century. The chalcocite (copper ore combined with sulphur – Cu_2S) found at Pahaquarry is not in the form of "pure" or native copper, instead much of it is so minutely disbursed in cupriferous silurian sandstone that its presence is not distinguishable with the naked eye. Some copper, however, may have oxidized on the surface as a greenish stain. This very heavy rock, in which the copper has been disseminated, has a density of several times that of water. In the seventeenth century, miners probably would have used a fire at the rock face to fracture the sandstone. Then, they would have used tools to pry off the loosened rock. Because of this technology, miners tended to concentrate on higher grade ore. As a result, they no doubt would have dismissed the low-grade Pahaquarry copper as unfeasible to mine. Since no mills or smelters existed in the New Netherlands at the time, the Dutch would have had to haul any ore-bearing rock to a port for shipment to Holland. Because of its density, the weight of this mineral impregnated sandstone would have required wagons with extra strong axles. In the 1600s, available wagons were not capable of hauling such heavy rock for 104 miles, especially over a crude road. Any attempt to carry such a load would have caused a wagon to collapse after a short distance. In addition, the percentage of copper contained in a ton of the Pahaquarry silurian sandstone has proved to be so low that, even if it were possible to haul the rock to the Hudson River, mill and smelter technology would have been incapable of refining it. These circumstances can be added to the fact that, in the 1650s, the small Dutch farm population in the Esopus area would not have been sufficient or interested in building a 104-mile road to mine copper. In addition, the legend authors would have one believe that this activity occurred during a period of warfare with the Native Americans who inhabited the Esopus region. In reality, this conflict, which occurred intermittently from the 1640s into the 1660s, kept Dutch settlement from spreading much beyond the immediate environs of the Esopus area.

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11. Samuel Hazzard, *Annuals of Pennsylvania From the Discovery of the Delaware* (Philadelphia: Hazard and Mitchell Pub., 1850, Reprinted Port Washington, N.Y.: Kennikat Press, 1970) 255; C. G. Hine, *Fact, Fancy, and Romance of the Old Mine Road, Kingston, N.Y., to the Mine Holes of Pahaquarry* (n.p.: 1908) 4-5; Cummins, *History of Warren County New Jersey*, 221-222; French, *Gazetteer of the State of New York*, 503; Honeyman, ed., *Northwestern New Jersey*, II:577, 591, 734; Amelia Stickney Decker, *That Ancient Trail: The Old Mine Road, First Road of Any Length Built in America* (Trenton, N.J.: Petty Printing Co., 1942) 9; C. H. Vivian, "The Mystery of Pahaquarry Copper," *Compressed Air Magazine* (March 1951) 3-4, Reprinted by the Ingersoll-Rand Company, 1951; Beck, *The Roads of Home*, 8-9; Weiss and Weiss, *The Old Copper Mines of New Jersey*, 82-87; Cunningham, *New Jersey: America's Main Road*, 36; Menzies, *Before the Waters*, 3-4; Vernon Leslie, *Faces in Clay* (Middletown, N.Y.: T. Emmett Henderson, 1973) 229-244; Valance, "Mining the Minisink and the Old Mine Road," 37-38; Kraft, "The Historic Minisink Settlements," 25-27.

EIGHTEENTH CENTURY MINING AT PAHAQUARRY

It is still not known when the Pahaquarry copper outcrop was discovered. The earliest evidence of the search for copper at Pahaquarry can be found in documents dating from the 1750s. In the previous decade, prospectors had discovered iron in Oxford township a short distance from the Pahaquarry area at what became Oxford Furnace. By 1743, a smelter had been constructed at that location. Such a discovery undoubtedly led men to search adjacent areas of northwest New Jersey for iron ore. Taking advantage of this discovery, John Reading, Jr., a wealthy resident of that colony, purchased 702 acres in Oxford township for ore, wood, water, and other conveniences "suitable for iron ore." He also obtained 200 acres near the head of Merril's Brook on Scotts Mountain in Oxford township that contained timber suitable for charcoal making. By the early 1750s, Reading joined a venture to extract copper from an area along Mine Brook in Pahaquarry township. An area resident, Anthony Maxwell, probably noticed some green stains left by copper that had oxidized from the rock along Mine Brook and brought it to Reading's attention. (During earlier journeys to the area in 1715 and 1719, Reading, ever observant for mineral deposits, had not made claim to the Pahaquarry site.) Consequently, on April 10, 1753, Reading took advantage of a land warrant that he had obtained some years earlier from the New Jersey Proprietor's Council and requested a survey of forty acres of land on the northeast side of that brook. Reading's brother-in-law, Martin Ryerson, a deputy surveyor, accomplished the task and Reading received the deed to this land on May 23, 1753. Shortly thereafter, Reading went into partnership with Anthony Maxwell and Martin Ryerson to mine copper on this land. These men evidently decided, however, that the mineral proved more abundant on an adjacent property. As a result, Reading joined with Samuel Johnson to obtain an additional 200 acres of land on the northeast of the forty acres. Each man had a half share. This property was surveyed and title conveyed to the two men on February 6, 1754. By deed dated 1754, Reading, along with Anthony Maxwell, took possession of two more acres of land that fronted on the Delaware River "a little to the northwestward" of the forty acres. These two acres were for use by the several persons "concerned in the affair of mining on the lands above mentioned with all the buildings and improvements thereon made and erected." In 1755, Reading sold one-half of his 100 acre share of land held with Samuel Johnson to his partners Maxwell and Ryerson. About the same time Ryerson obtained twenty-four acres joining the original forty acre tract on the southwest and, in turn, sold Reading four acres of that parcel on August 20, 1755 (see 1753-1912 Property Ownership Map).[12]

Despite the threat of attack from French allied Indians during the 1756-58 period, considerable exploration for copper took place at Pahaquarry. The land was probably covered by a deciduous forest dominated by oak and hemlock with some hickory, tulip, and maple admixtures. These trees provided construction material for buildings and mine

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12. Deeds dated May 24, 1753 and February 6, 1754, Recorded in Book S-6, pages 119 and 207, West Jersey Proprietors Records, Surveys: 3 Books E, S-6, and H, Microfilm set 47, Reel No. 8, New Jersey State Library Archives, Trenton, New Jersey; Deed dated January 29, 1761, Recorded in Deed Book Liber A-V, pages 76-79, Box 123, Department Genealogical Society, Record: West Jersey Deeds Vols. A-T, A-V, and A-W, New Jersey State Library Archives, Trenton, New Jersey; Josiah Granville Leach, *Genealogical and Biographical Memorials of the Reading, Howell, Yerkes, Watts, Latham, and Elkins Families* (Philadelphia: J. B. Lippincott Co., 1898) 119-121; Wacker, *Land and People*, 49-50.

timbers. Reading and his partners constructed a stamp mill, the source of power for which came from water stored behind two dams on Mine Brook and diverted through a race (Illustration 6). Several buildings were constructed on the two-acre parcel which fronted the Delaware River to serve as housing for the workforce, as well as a dwelling for Anthony Maxwell, and probably a barn. The first effort to locate copper ore was undoubtedly conducted high on the hill across Mine Brook opposite the later explorations. Here, five prospect pits give evidence of this activity (See Existing Conditions Section Land Use Map and Structures Map Sheet 1). Not finding any substantial ore at that location, the search turned to the other side of Mine Brook where several adits and inclined shafts were dug. A crude road was undoubtedly built along Mine Brook to these mining locations and probably served for pack animals. The workcrew dug two adits (numbers 1 and 2 - see Illustration 7, Dickeson's 1862 Drawing of the Alleghany Mining Company's Property, Illustration 8, Enlargement of a Portion of Dickeson's 1862 Drawing of the Alleghany Mining Company's Property, and the 1753-1760 Historic Period Plan), each from fifty to 100 feet in length, into the hill on the southwest side of Mine Brook. In addition two inclined shafts (numbers 3 and 4 - see Illustration 8, Enlargement of a Portion of Dickeson's 1862 Drawing) were sunk on angles of forty to forty-five degrees to follow the slope of the copper vein. Shipments of copper-impregnated rock were undoubtedly made by boat from the two acres of land which the partners owned on the Delaware River. The mining operation undoubtedly proved unprofitable and ceased by 1760. In 1761 Reading deeded his share of the land, buildings, and copper mines to his ten children. Prospects for successful mining were apparently so dim that Reading's son Richard advertised his share of the land and mines for sale about the time that his father died in 1767.[13]

Mining in this era was a laborious and dangerous job. Before drilling began, the individual in charge of blasting would study the face of the rock to ascertain where to place the holes. Advantage was taken of all irregularities and joints as a means to reduce the number of holes. In the narrow confines of the Pahaquarry adits and inclined shafts, holes were drilled by hand with a single-jack method. A single jack was a hammer weighing about four pounds. It was swung with one hand while the drill was held by the other hand. After each blow the drill was given a quarter turn. Theoretically, the drill was turned on a center in the middle of the hole. The successive cuts crossed each other and the hole was broken a little wider in diameter than the drill diameter. A curved bit on the end of the drill had, for centuries, proved best for two reasons (Illustration 10). Curved bits gave the most uniform wear. In addition, drills were not usually held straight and the hammer blow was usually not directly on center. As a result, a drill with a curved end was found to transfer an off-center hammer blow more directly to the center of the drill bit. Thus, more energy from the force of the blow went into drilling the hole. In the eighteenth century, metallurgy had not reached modern standards and the softer, iron metal used for drills required frequent sharpening.[14]

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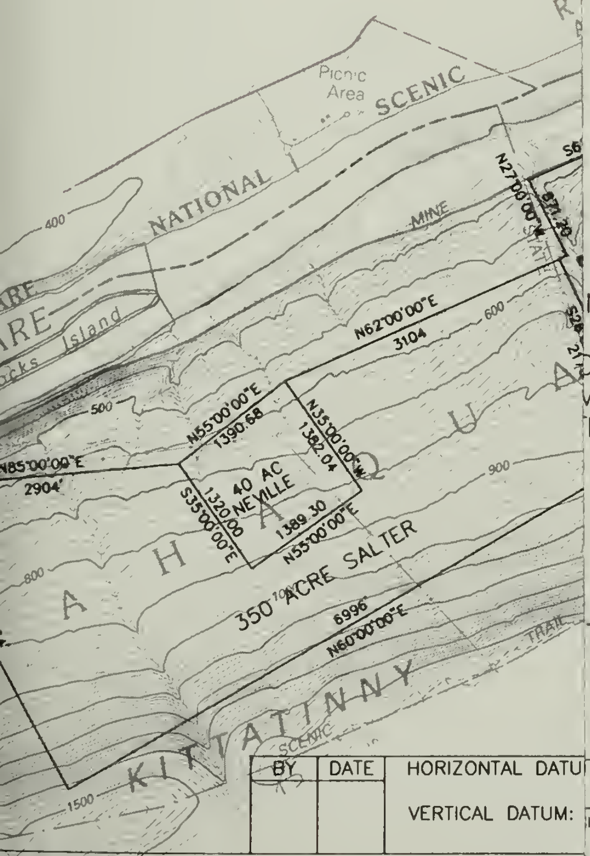
13. Deed Book Liber A-V, 76-79; Montroville Wilson Dickeson, *Report of the Geological Survey and Condition of the Alleghany Mining Company's Property, Warren County, New Jersey, with Map and Drawing* (Philadelphia: J. B. Chandler, 1862) 3-8; *The Pennsylvania Chronicle* (Philadelphia), August 24-31, 1767.

14. Henry S. Drinker, *Tunneling, Explosive Compounds, and Rock Drills* (N.Y.: John Wiley and Sons, 1882) 114-116.



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UNDARY ABSTRACT PLAN

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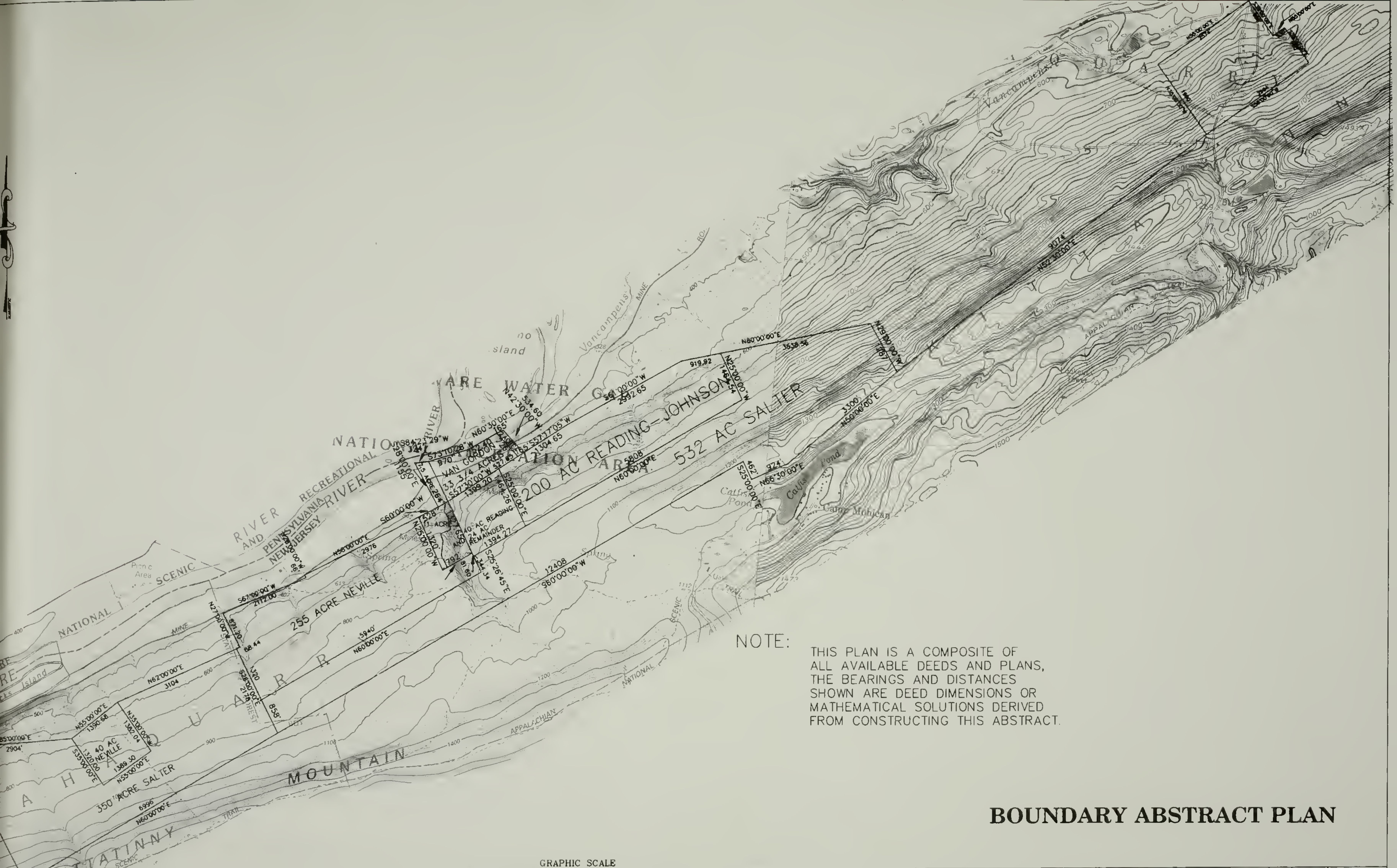

NOTE: THIS PLAN IS A COMPOSITE OF ALL AVAILABLE DEEDS AND PLANS, THE BEARINGS AND DISTANCES SHOWN ARE DEED DIMENSIONS OR MATHEMATICAL SOLUTIONS DERIVED FROM CONSTRUCTING THIS ABSTRACT.

BOUNDARY ABSTRACT PLAN

GRAPHIC SCALE

(IN FEET)
1 inch = 2000 ft.

BY	DATE	HORIZONTAL DATUM: N/A VERTICAL DATUM: N/A	UNITED STATES DEPARTMENT OF THE INTERIOR NATIONAL PARK SERVICE DENVER SERVICE CENTER	A-E FIRM NAME: CITY, STATE: CONTRACT NUMBER:	FIELD WORK: DRAWN: TMD	CHECKED:	TITLE OF SHEET BOUNDARY ABSTRACT PLAN PAHAQUARRY COPPER MINES	PKG. NO 264AB	SHEET 1 OF 2	DRAWING NO. 620 41095

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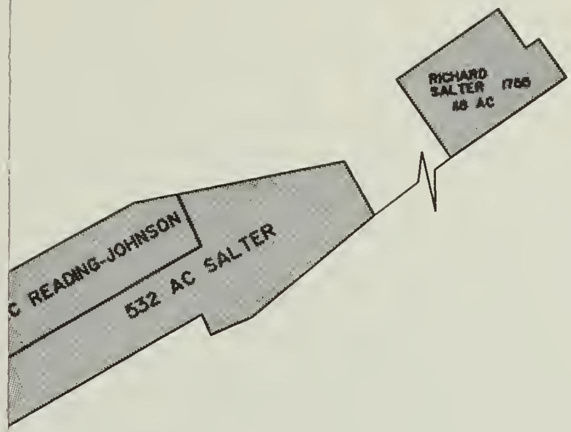
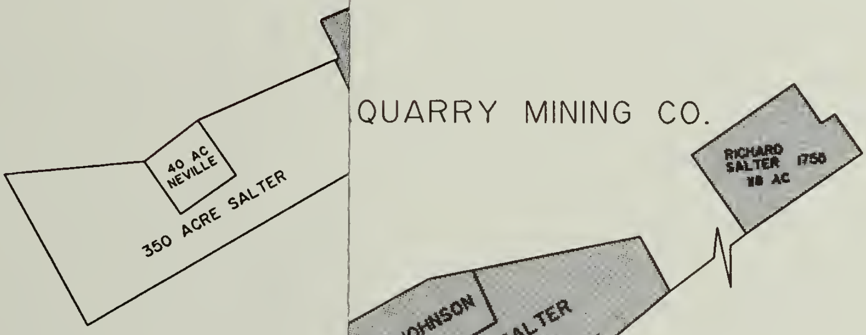
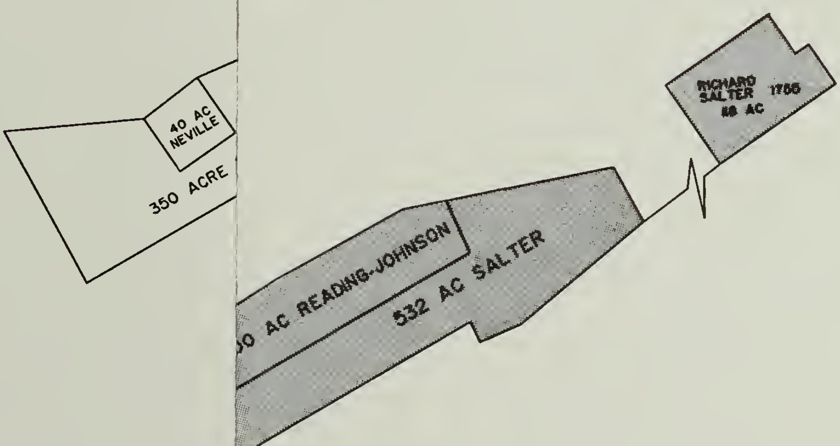


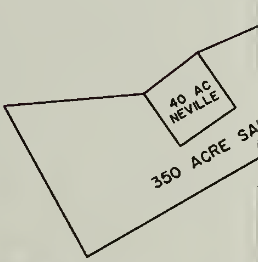
QUARRY MINING CO.



1861-62



8 DIRECTORS



ROPERTY OWNERSHIP MAP

REVISIONS	BY	DATE	HORIZONTAL DATUM		OWNERSHIP SHEET	PKG. NO.	SHEET	DRAWING NO.
			VERTICAL DATUM:	ED: PS	DELAWARE WATER GAP N.P. PAHPQUARRY COPPER MINES	264AB	2 OF 2	620 41095

Drawing File: quarry-2

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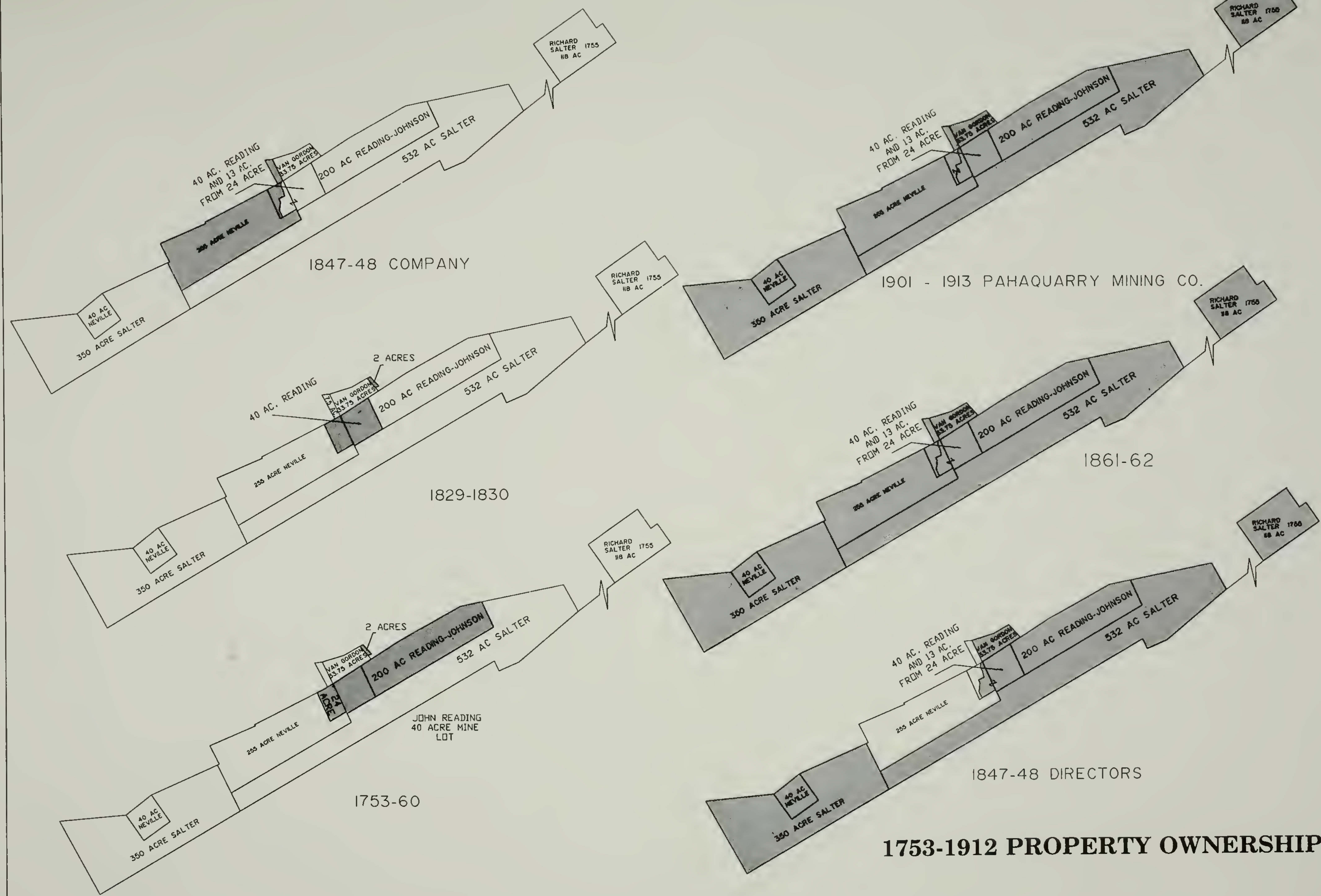

1753-1912 PROPERTY OWNERSHIP MAP

REVISIONS	BY	DATE	HORIZONTAL DATUM: NAD 27 / VERTICAL DATUM: NGVD 29	GRAPHIC SCALE NTS	UNITED STATES DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE, DENVER SERVICE CENTER	A-E FIRM: ERDMAN ANTHONY ASSO, MECHANICSBURG, PA. CONTRACT NUMBER: 1443-CX-2000-92-014	FIELD WORK: FARLEY/EAA; DRAWN: EAA; CHECKED: NPS	OWNERSHIP SHEET, DELAWARE WATER GAP N.P., PAHPQUARRY COPPER MINES	PKG. NO. 264AB	SHEET 2 OF 2	DRAWING NO. 620 41095

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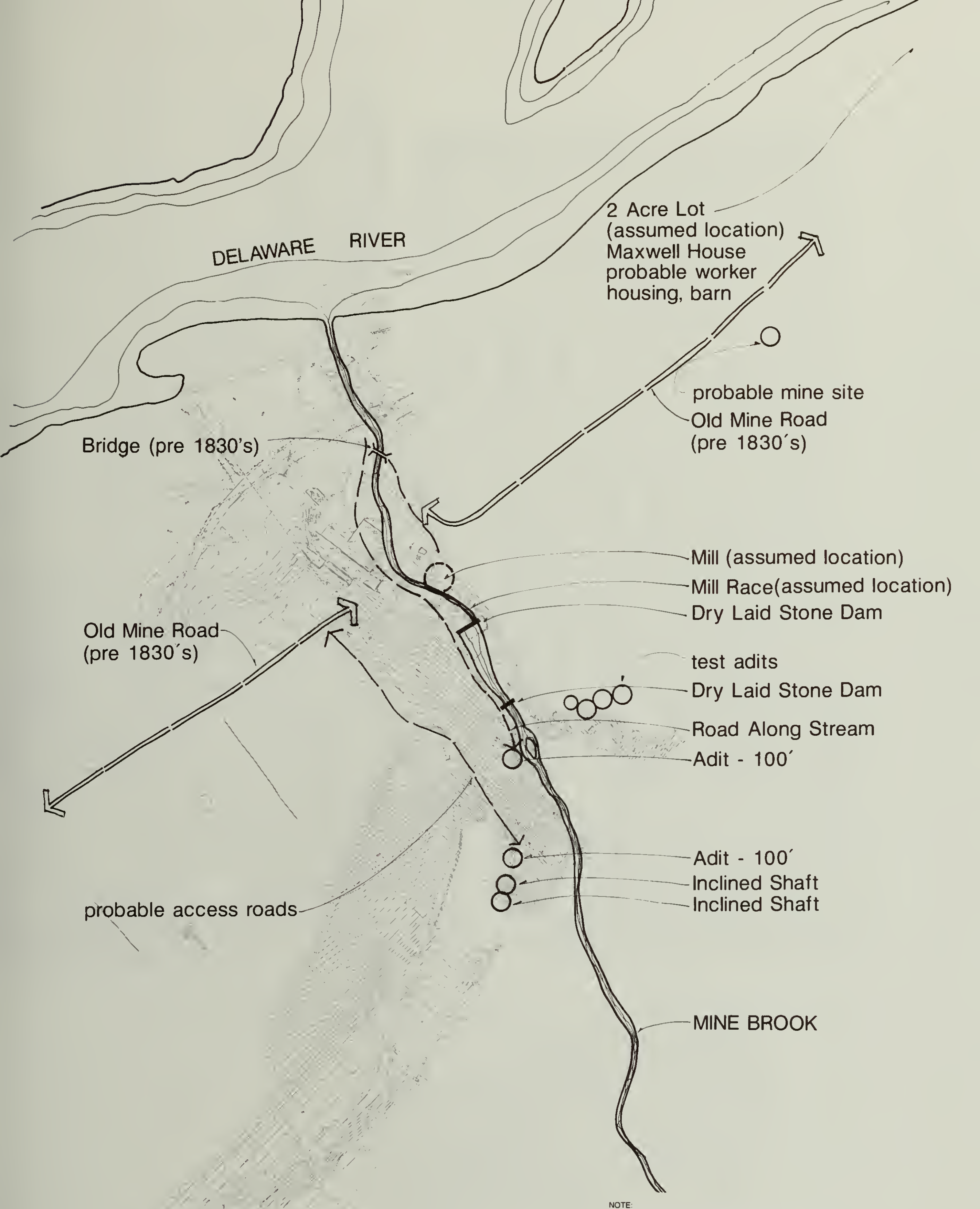


NOTE:

IT IS POSSIBLE THAT SOME REWORKING OR TEST HOLES ATTRIBUTED TO THIS PERIOD ARE FROM THE 1829 PERIOD. HOWEVER, ANY WORK ATTRIBUTABLE TO THE 1829 PERIOD WOULD HAVE BEEN MINIMAL AS EXPLAINED IN THE TEXT.

HISTORIC PERIOD PLAN
MINING ERA
1753-1760

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

DSC • 620 • 25021 • NOV 93

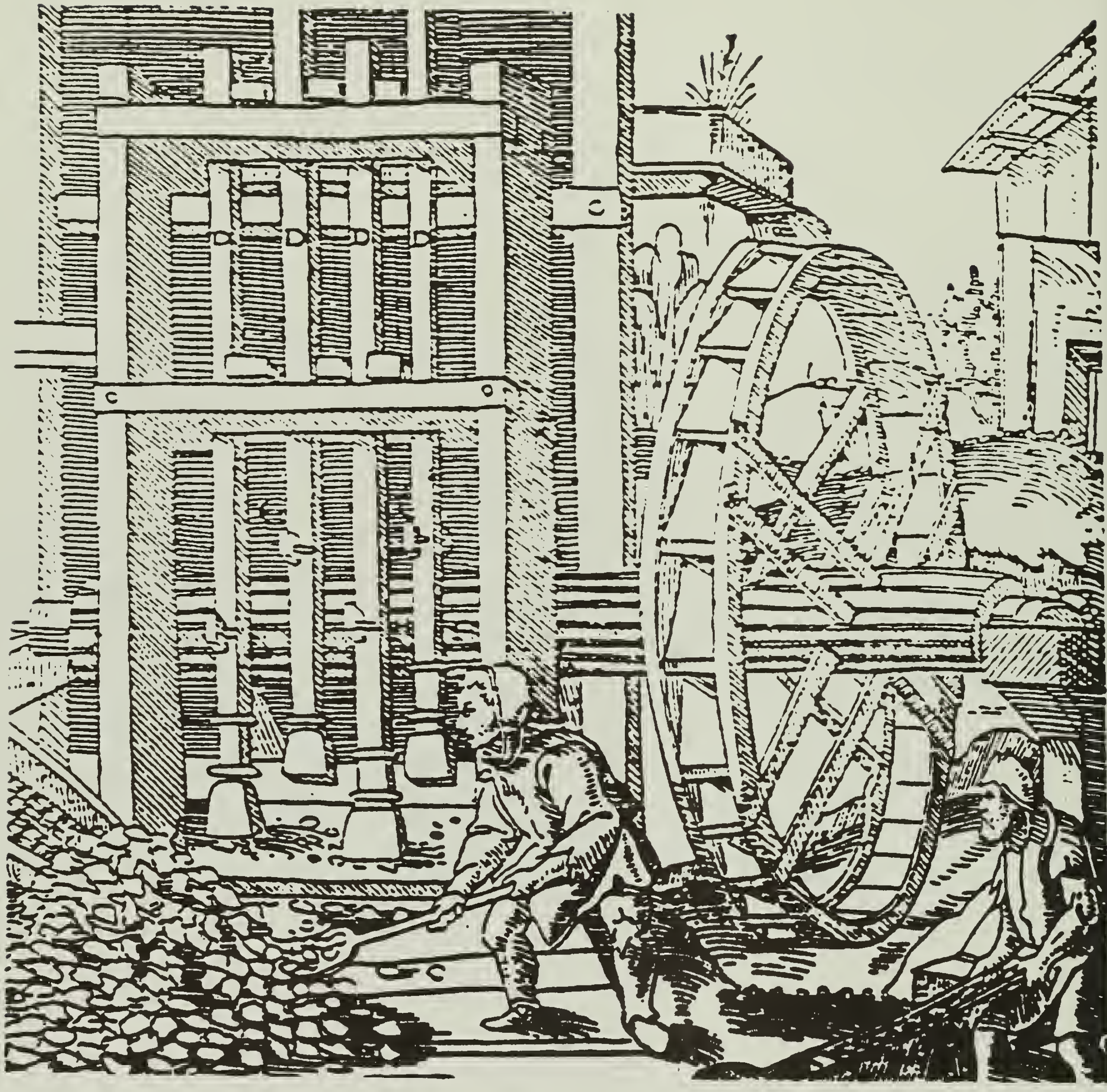
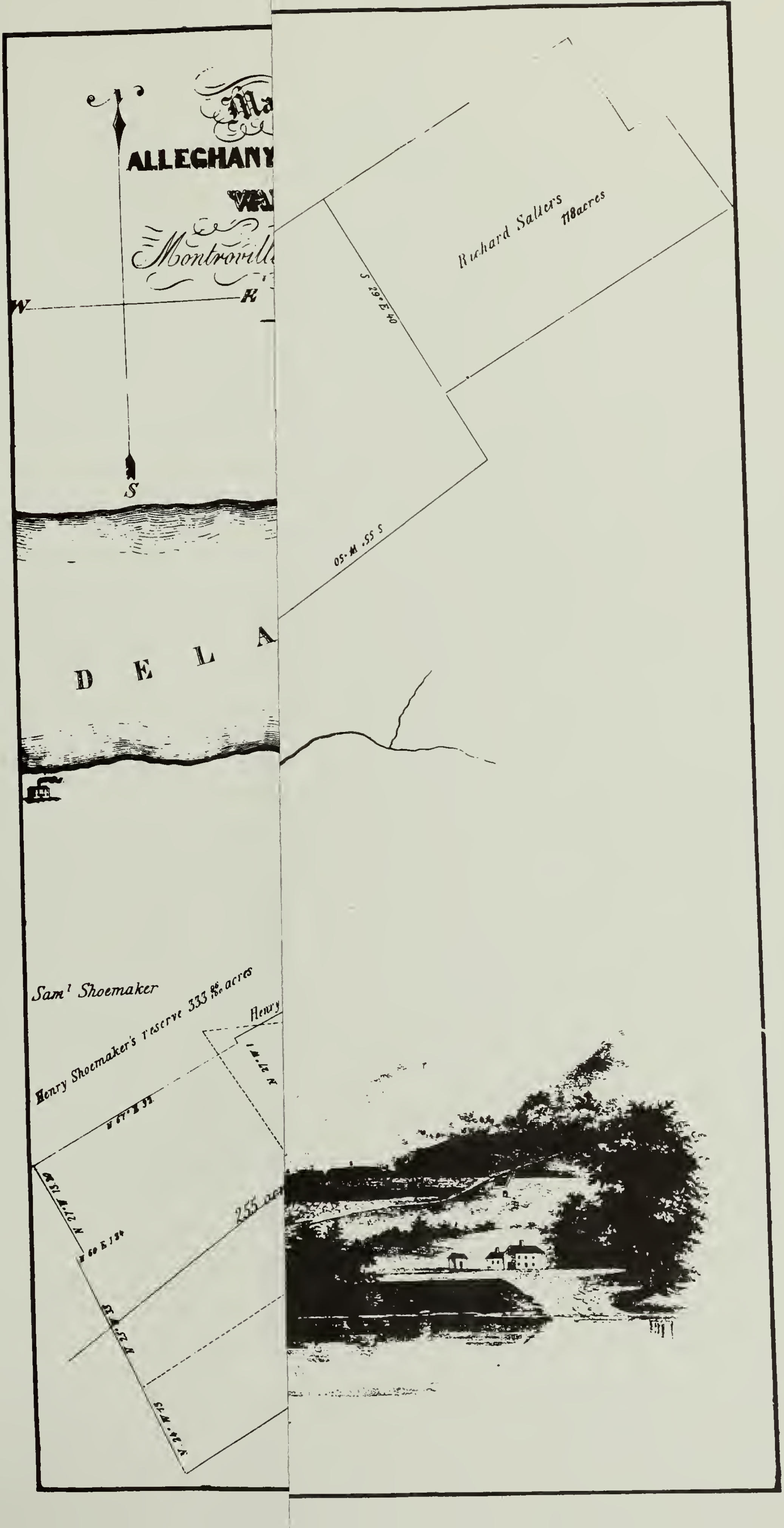


Illustration 6: Typical Sixteenth Century Stamp Mill in Use During the Eighteenth Century
From Georgius Agricola, *De Re Metallica*


ALLEGHANY
Montroville
W
E
S
DELA
Richard Salters 118acres
S 29 E 40
S 55 W 50
Sam' Shoemaker
Henry Shoemaker's reserve 333 acres
Henry
255 acres

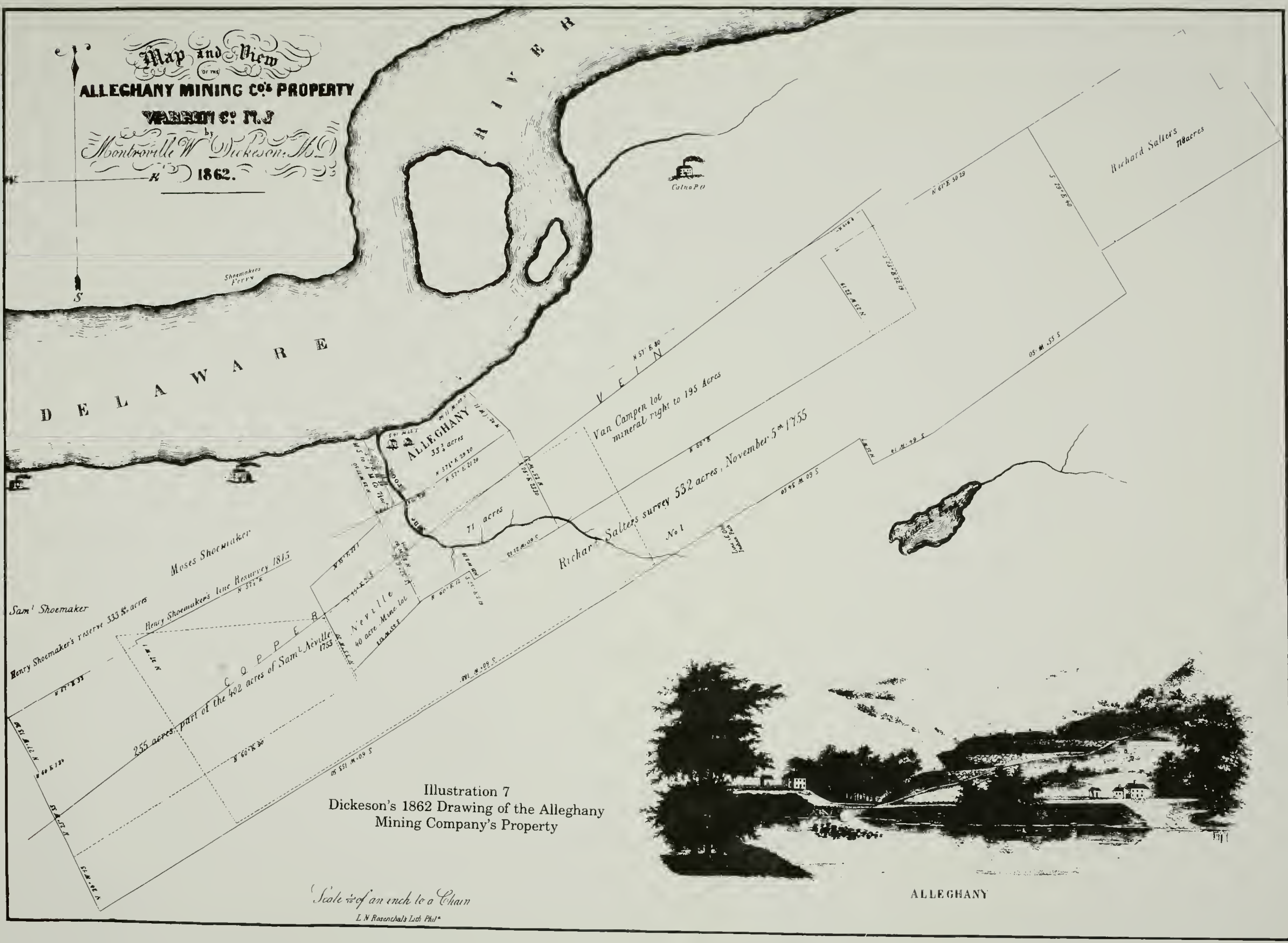


Illustration 7
Dickeson's 1862 Drawing of the Alleghany
Mining Company's Property

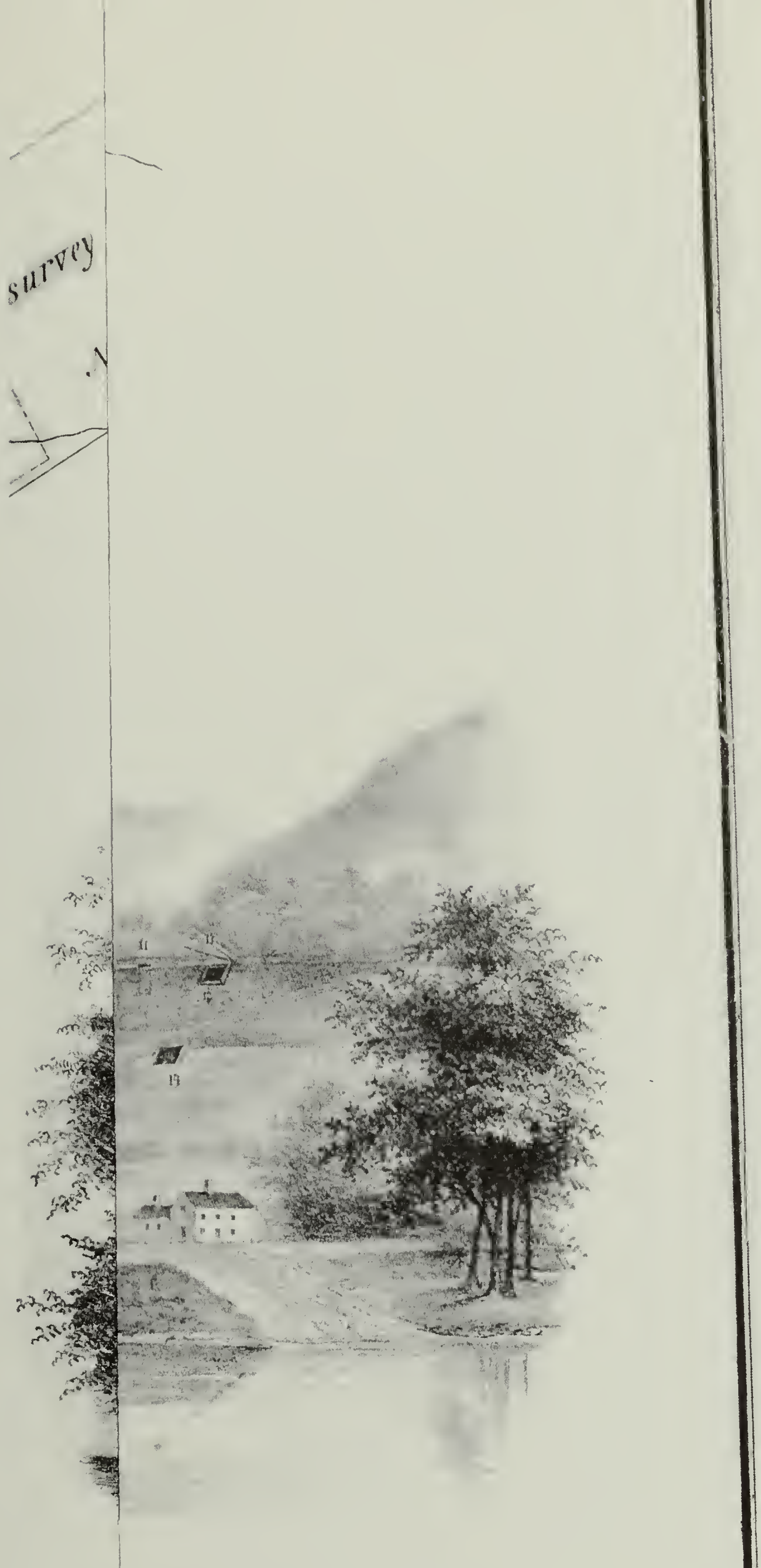


Illustration 8
ement of a Portion of Dickeson's 1862 Drawing
the Alleghany Mining Company's Property

Illustration 8
Enlargement of a Portion of Dickeson's 1862 Drawing
of the Alleghany Mining Company's Property

Drilling was time consuming work. Holes were usually one-inch in diameter and seldom deeper than three feet. In the hard sandstone at Pahaquarry, it probably took a man as much as an hour and a half to drill one foot. Once the proper number of holes had been drilled, the area was ready for blasting. Each hole was charged with black powder that had been wrapped in paper. The powder was pushed to the bottom of the hole by using a wood or copper pole. Wood or copper would not cause a spark that could ignite the powder. A copper needle, which was a small rod, was inserted into the hole and then the hole was filled with clay and tamped with the wood or copper rod. After tamping, the copper needle was withdrawn leaving a small hole through which a fuse was introduced. Fuses consisted of reeds or straws filled with powder. These fuses often did not give a uniform burn and, therefore, a delayed explosion could prove dangerous to workers who re-entered an adit. Rarely did the blast penetrate to the depth of the drill hole. Often it removed rock to only about half the length of the drill holes. Since drill holes in this period were placed in the face of the rock to be blasted, the explosion would have destroyed evidence of these holes.[15]

Blasts were usually set just before meal time so that the dust could settle while the workforce ate. After the dust settled, several men entered an adit or shaft to carefully inspect the walls and roof before the other workers entered to remove the loose rock. Removing the blasted rock was an exhausting job accomplished by hand labor. Men probably shoveled the rock into buckets or wheelbarrows to remove it from the mines. Before the copper could be shipped, it was separated from waste rock. The first separation occurred at the mine, where experienced miners hand sorted the ore that visibly contained copper from the waste rock that was taken to the mine dump. The hand-sorted ore was probably placed on a pack animal to take it to the stamp mill. At the mill, the hand-sorted ore was pulverized by laborers wielding sledge hammers. Laborers shoveled the broken ore under the mill stamps. The stamps were heavy, metal blocks attached to wooden poles. The poles were raised and then dropped by a carn attached to a power system connected with a water wheel. As the stamps thudded down on the ore, water flowed across the rock, washing away lighter waste. One final step, hand-jigging, used the flow of water and gravity to separate further waste. Merely a box with a screen, the jig was hand-shook with a jerking motion to separate the heavier ore from the waste sands. The final separation of waste from the copper would occur in distant smelters and refineries.[16]

AN IDLE PERIOD 1767-1829

No additional search for copper occurred at Pahaquarry for sixty-two years. John Reading, Jr's., grandchildren, Joseph, Mary, and Anna Reading acquired the mining property that included the forty acre tract along with the 200 acre, twenty-four acre, and two acre parcels. In 1822, Thomas Gordon bought a half-share in this land. Gordon, a Trenton lawyer, had an interest in mining and minerals and, at one time, had served as William Shippen's attorney. Shippen owned the iron mines and smelter at nearby Oxford Furnace. Samuel Johnson evidently thought that the land adjoining the prospect adits and shafts

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15. Drinker, *Tunneling, Explosive Compounds, and Rock Drills*, 108-109.

16. Harold W. Richardson and Robert S. Mayo, *Practical Tunnel Driving* (N.Y.: McGraw-Hill Book Co., 1941) 333.

might eventually yield valuable ore. Toward the end of the 1760s he purchased a forty-acre tract to the southwest of the mining property known as the Neville Lot and the remainder of Neville's 255 acres that bordered to the southwest on the twenty-four acres owned by the Readings. In addition, Johnson bought the 350 acre Salter property that surrounded the Neville forty acre lot and one non-contiguous 118 acre tract to the north that had been surveyed to Richard Salter in 1755. William Diltz later bought this land from Johnson. Diltz also acquired the 532 acre Salter parcel on October 2, 1792. On May 1, 1811, Diltz conveyed two of these tracts, the 350 and 118 acre parcels, to John Johnson (one of Samuel's descendants), James Bishop, and James Van Kirk. Nathaniel Saxton, a Philadelphia lawyer and friend of Thomas Gordon, ultimately bought the forty acre Neville lot along with the remainder of the 255 acre Neville land and the 532 acre Salter property from Diltz. (see Illustration 9, Pre-1845 Land Survey Map).[17]

After the Pahaquarry site was abandoned by 1760, only sporadic mention was made of it. Whether or not he viewed the prospect adits and shafts, Samuel Preston wrote in his 1828 letters that, in 1787, they had not been operated for some time as the entrances had become overgrown with brush.

A BRIEF RENEWED INTEREST IN PAHAQUARRY COPPER 1829-1834

After years of owning the inactive Pahaquarry copper land, Joseph Reading and his half-interest partner Thomas Gordon hoped to prosper from their holdings. Perhaps at the instigation of Gordon, the two men granted the forty acre, twenty-four acre, and two acre tracts to Henry Miller, David Bruce, and David Kirkendal on December 21, 1829. Miller, Bruce, and Kirkendal received these parcels on a 999 year grant for the purpose of digging, searching, and exploring for copper and other valuable ores and minerals. Reading and Gordon placed several stipulations on the grant by which they were to receive ten percent of all copper and other valuable ores recovered from mining. Miller, Bruce, and Kirkendal also agreed that if they or their heirs did not discover or produce any ore or minerals from the mine or mines during the first five successive years from the date of December 21, 1829 or any five successive years during the term of the grant, then the grant would be void. The three men evidently did little work at the site. After obtaining ore samples that, when assayed, showed little promise of yielding copper in any amount, they probably abandoned the property. At any rate, the grant was soon nullified and the property again fell solely under the control of Reading and Gordon. These two men began to divest themselves of the property in 1834 with the sale of the 200 acre tract to Moses Van Campen, a local farmer. Another farmer, Andrew Ribble, bought the other three parcels as a combined seventy-one acre package in early 1845.[18]

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17. Mary Reading, Anna Reading, and Joseph Reading and wife to Thomas Gordon, January 1, 1822, Sussex County Deed Book W2, pp. 99-100, Sussex County Courthouse, Newton, New Jersey; Peter I. Clark and wife Cynthia to the Alleghany Mining Company, September 19, 1861, Warren County Deed Book 53, pp. 268-270, Warren County Courthouse, Belvidere, New Jersey.

18. Joseph Reading and Thomas Gordon to Moses Van Campen, September 1, 1834, Warren County Deed Book 20, p. 252; Thomas Gordon, Joseph Reading, and Anna Reading to Andrew Ribble, April 1, 1845, Warren County Deed Book 28, p. 4, Warren County Courthouse, Belvidere, New Jersey.

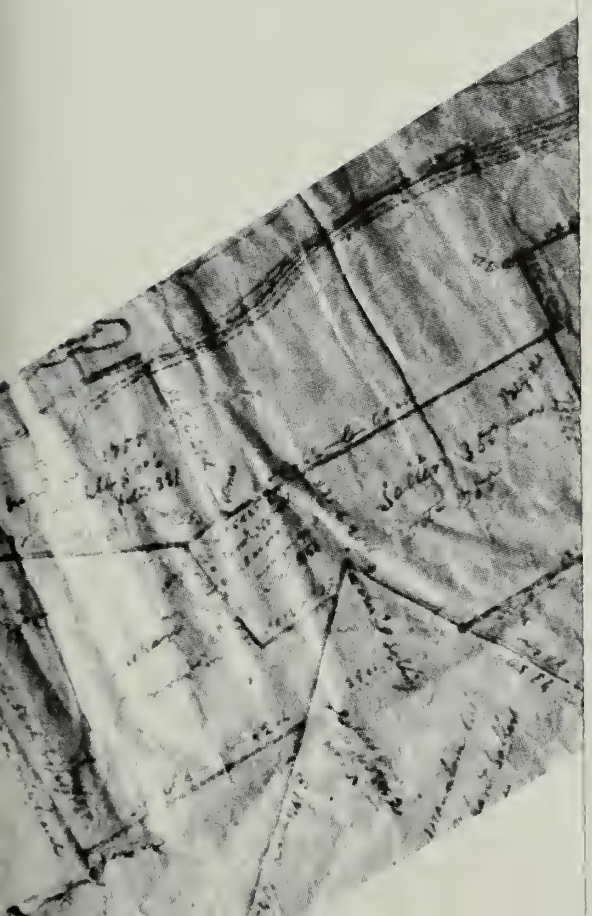

Illustration 9
Pre-1845 Land Survey Map
Courtesy of the Camden County Historical Society
Camden, New Jersey

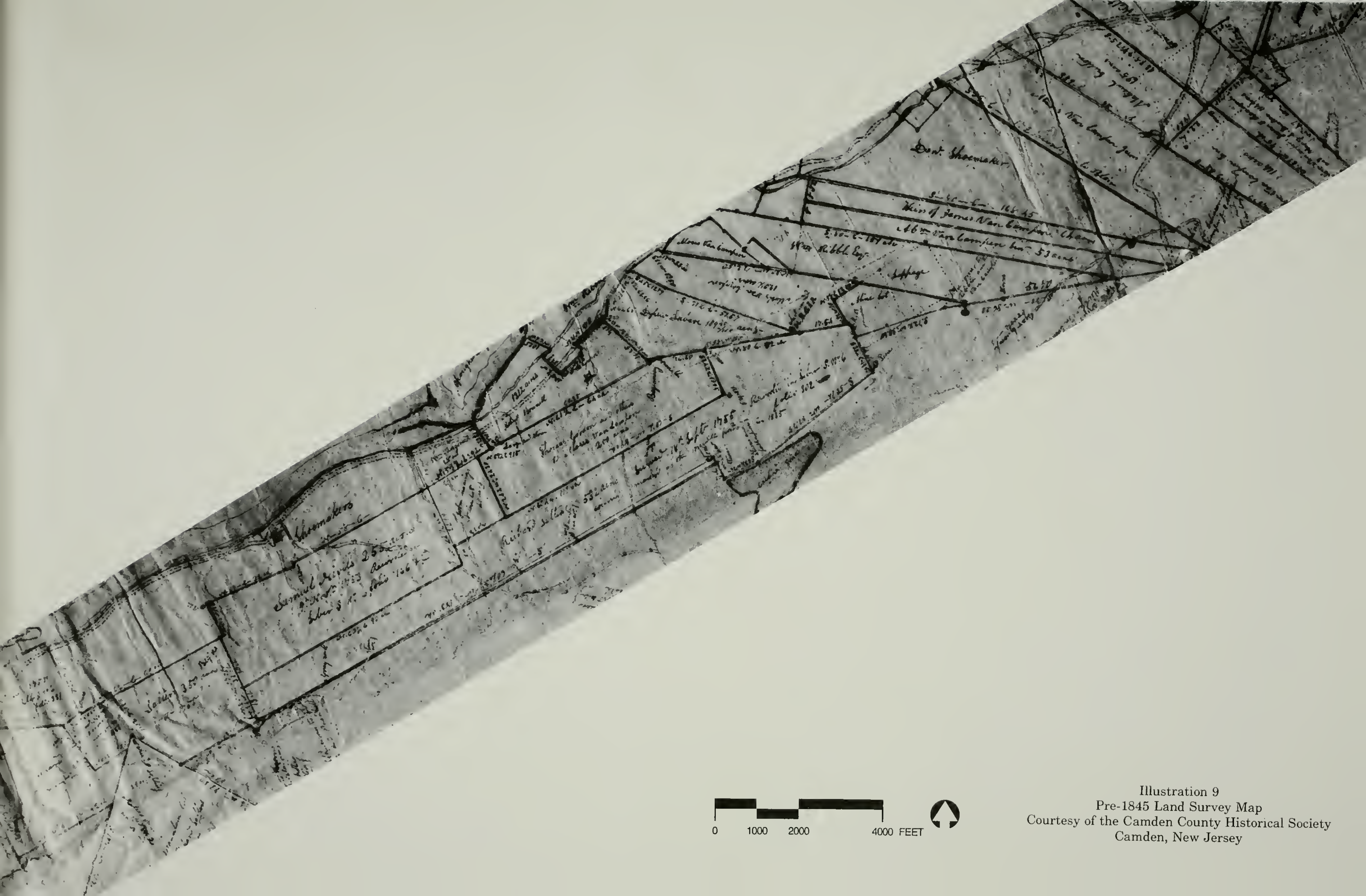

Illustration 9
Pre-1845 Land Survey Map
Courtesy of the Camden County Historical Society
Camden, New Jersey

The conclusion that Miller, Bruce, and Kirkendal did little work at the site can be supported by the observations of Henry Rogers, the first New Jersey State Geologist, who did not detect recent work when he examined the Pahaquarry mines in the late 1830s. He was the first of a number of professional geologists to note that the Pahaquarry chalcocite was so thinly disseminated in the rock that copper could not be recovered profitably. In his report, published in 1840, he remarked that

> at an early period in the settlement of the district, two or three excavations were undertaken in search of the ore [copper], at the westerly base of the Blue Mountain, near Pahaquarry, but nothing was reached of sufficient value to reimburse the adventurers. The mining holes are now obstructed by rubbish, but specimens of the ore indicated nothing to warrant a renewal of the attempt.[19]

During that era, Rogers was not the only person to view the mines. In 1840 a Philadelphia mining engineer, John Jordan, came to the site, and, like Rogers, did not observe recent workings. He found two "horizontal shafts" that were fifty to 100 feet long and contained a three-to four-inch copper vein at the ends.[20]

THE ERA OF THE ALLEGHANY MINING COMPANY 1847-1867

During the 1840s, when copper was discovered in the Upper Peninsula of Michigan, a great interest in copper prospecting and mining developed in the United States. In this period of the 1840s and 1850s, as ship building increased, copper consumption grew to meet the demands for its use as a material for sheathing wooden vessels. At the same time, the expansion of brass manufacturing brought further demand. This situation undoubtedly explained the reason for Charles Bartles, Peter I. Clark, and James N. Reading's attraction to the Pahaquarry area. Bartles, a wealthy lawyer from nearby Flemington, New Jersey, had investments in several mines, as well as railroads and real estate. On August 5, 1845, he purchased seventy-one acres on the northeast side of Mine Brook from Andrew Ribble. This land contained the original John Reading forty acre tract plus the twenty-four acre and two acre parcels that Joseph Reading and Thomas Gordon sold to Ribble in April 1845. Bartles' friend and fellow Flemington resident, Peter I. Clark, soon began to acquire adjacent property. When Nathaniel Saxton could not repay a debt that he owed to Abraham Wildrick, his land at Pahaquarry was sold by the Warren county sheriff at a public auction on September 2, 1846. Clark took advantage of Saxton's financial problems to obtain three lots of land that surrounded the Pahaquarry mines. Clark bought the land for $25. Several days later another friend, James N. Reading purchased a 195 acre tract from Moses Van Campen that had been part of the original 200-acre Reading/Johnson land.[21]

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19. Henry Darwin Rogers, *Description of the Geology of the State of New Jersey, Being a Final Report* (Philadelphia: C. Sherman and Co., 1840) 105.

20. Patricia M. Valance, "Mining in the Minisink and the Old Mine Road," in Bertland, et al., *The Minisink*, 41.

21. Peter I. Clark land purchase at a sheriff's auction, September 2, 1846, Warren County Deed Book 26, pp. 526-528; Moses Van Campen to James N. Reading, September 5, 1846, Warren County Deed Book 27, pp 558-560, Warren County Courthouse, Belvidere, New Jersey.

On February 26, 1847, Peter I. Clark joined with James N. Reading, William P. Clark, Charles Bartles, James Hunt, and Alexander V. Bonnell to form the Alleghany Mining Company. Reading was elected president and Bartles became treasurer. This corporate body purchased 188.7 acres from Peter I. Clark and eleven adjoining acres from Charles Bartles on May 7, 1847, as well as another 7.5 acres from Moses Shoemaker on May 19, 1847. Clark and Bartles, however, did not sell all of their holdings to the new mining company. Reading sold none of his land to the company. (See 1853-1912 Property Ownership Map.)[22]

The Alleghany Mining Company officials hired mostly local men and proceeded to explore for copper ore beginning in April 1847. James Hunt oversaw the initial investigation until he resigned from the board of directors on May 8, 1847. I. A. Sheaff replaced Hunt as superintendent. Both of these men chose to ignore the 1750s adit number 2 and inclined shafts number 3 and 4. Hunt, however, extended adit number 1 for about fifty feet in a northwesterly direction. Records in the Charles Bartles papers indicated that, during August and September 1847, one workman, Thomas Dowling, was paid for a forty-five feet extension of new adit work. On the basis of this evidence, this adit work probably occurred in adit number 1. Most of the prospecting, however, concentrated on the upper terrace areas to the southwest of Mine Brook where ten openings were made between April 1847 and March 1848 (numbers 5 through 14 - see Illustration 8, Enlargement of a Portion of Dickeson's 1862 Drawing of the Alleghany Mining Company's Property). In that period, number 5, a shaft with an opening diameter of 7 x 15 feet, was sunk to a depth of twenty feet. Four other shafts, numbers 6, 9, 10, and 11, seemed to have been shallow prospect holes. A cut about 100 feet long and fifteen feet deep (number 7) led to a shale arch, later termed the "Elephant's Back," into the center of which an opening was excavated (number 8). Two adjacent adits (numbers 12 and 13) were located on the terrace below number 11. Dickeson did not give the length of number 12, but number 13 had a length of ten feet above which ran a cross-cut of about seventy-five feet. Shaft number 14 was dug to a fifteen foot depth. Since all trace of this shaft has been erased, it has no doubt been covered by tailings from early twentieth century activity (see 1847-62 Historic Period Plan).[23]

The methods employed to drive adits and shafts probably differed little from the eighteenth century except that technology had improved to the point that miners used much harder steel drills. In addition, the Bickford safety fuse, invented in England, came into use in 1831 (Illustration 10). It comprised a cord around a thin vein of powder. The cord was covered with tar or pitch. The advantage of this fuse was its steady uniform

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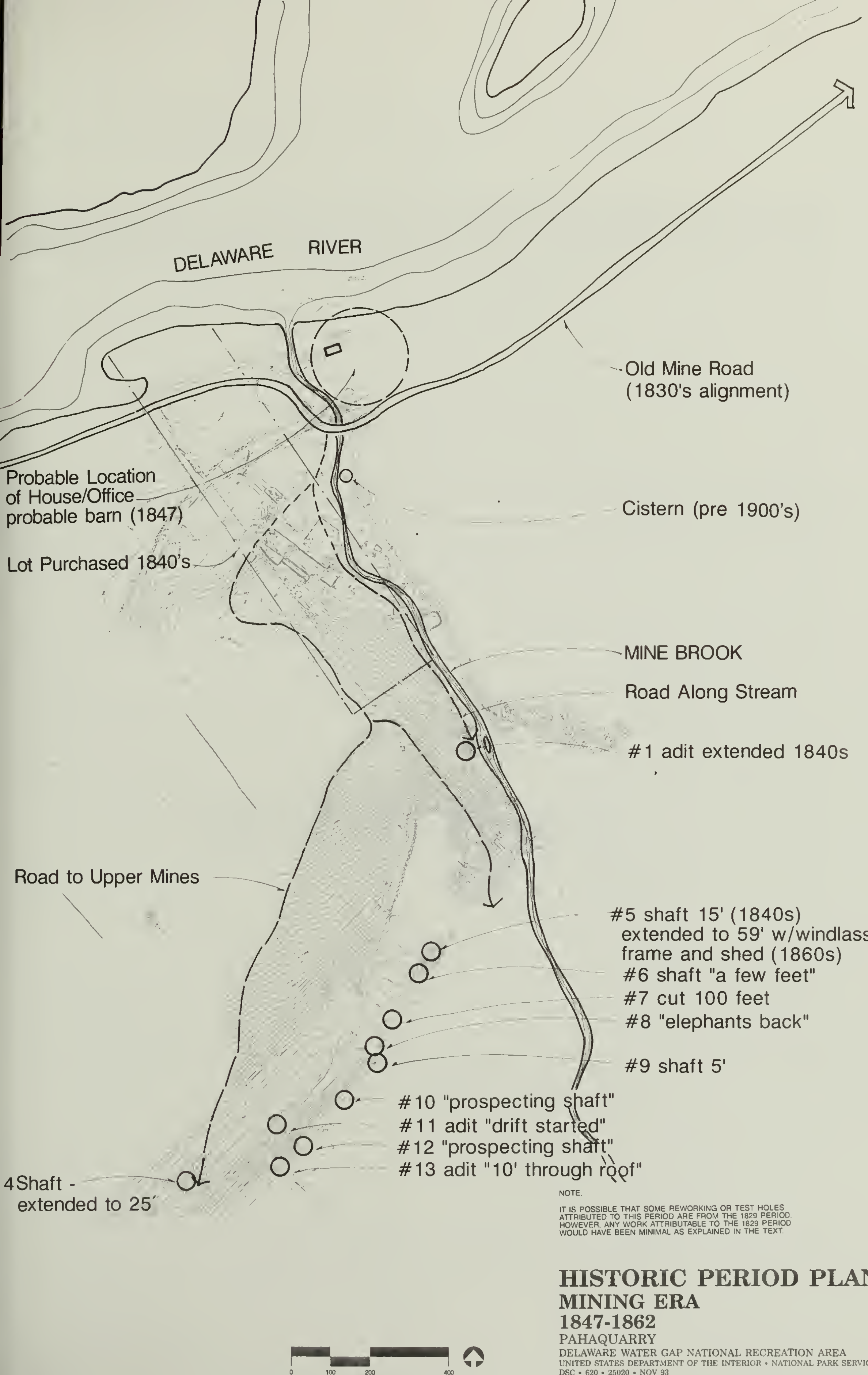
22. Peter I. Clark and Wife Cynthia to the Alleghany Mining Company, May 7, 1847, Warren County Deed Book 28, pp. 59-60; Charles Bartles and Wife Elizabeth to the Alleghany Mining Company, May 7, 1847, Warren County Deed Book 28, pp. 39-41; Moses Shoemaker and Wife Sarah to the Alleghany Mining Company, May 19, 1847, Warren County Deed Book 28, p. 50, Warren County Courthouse, Belvidere, New Jersey; An Act to Incorporate the Alleghany Mining Company, February 26, 1847, Charles Bartles papers, Box 33, Folder 2110, Hunterdon County Historical Society, Flemington, New Jersey; Dickeson, *Report of the Geological Survey and Condition of the Alleghany Mining Company's Property*, 19-21.

23. Dickeson, *Report of the Geological Survey and Condition of the Alleghany Mining Company's Property*, 7-11; Pay receipts for Thomas Dowling, August 25, 1847, August 31, 1847, September 8, 1847, and September 19, 1847, Charles Bartles papers, Box 33, Folders 2105 and 2106.



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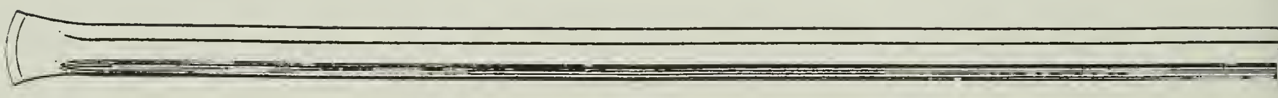
HISTORIC PERIOD PLAN
MINING ERA
1847-1862
PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

DSC • 620 • 25020 • NOV 93

BICKFORD SAFETY FUSE



CURVED BIT DRILL

SINGLE JACK HAMMER

Illustration 10
Mining Equipment: the Bickford Safety Fuse,
Curved Bit Drill, and Single Jack Hammer

burn. Otherwise, holes were drilled in the same time-honored manner and black powder remained for the explosive.[24]

To support the operation, the Alleghany Mining Company constructed a dwelling house which included office space in the attic. According to the June 24, 1847 description for this building, supplied for potential bidders, the house was to be 18 x 32 feet with an attached 12 x 18 feet kitchen. A cellar with six-foot-high rock walls was to be placed under the main part. Specifications called for a frame building that rested on oak sills, enclosed with white pine, and covered with a slate roof. The first floor was divided into two rooms with seven-foot ceilings, while the second floor contained three rooms with seven-foot ceilings. Presumably, the attic incorporated one room. Inside walls were to be plastered with lime and covered with two coats of white lead paint. An interior stairway carried to the attic. The description stated that joists were to be 3 x 8 inches on an eighteen-inch center, while the floors were covered with white pine except for the first floor which was to be yellow pine. At one end, a chimney carried the extent of the building from a brick foundation and contained a fireplace on the first and second floors. A smaller chimney on the other end of the structure ran from the attic office and was designed to admit a stove pipe. The design called for four windows in the front, two windows on each end, and three windows at the rear of the first floor. Each window had to contain twelve lights that were 8 x 10 inches. The second floor had five windows in the front, two windows on each end, and three windows in the rear, with the same dimension glass as that of the lower floor. The attic had two end windows, each having six lights, while the front contained five windows and the rear three windows, each with three, 10-x 12-inch panes of glass. Entry doors at the front, rear, and rear of the kitchen were to have two panels over two panels. A plain portico with two columns encompassed the front door. It was stipulated that the exterior weather boards on the front and sides receive two coats of white lead paint while the rear was to be covered with white wash. On July 22, 1847, Jonas Kintner won the bid to construct the dwelling. Although the contract specified that the building should be completed by October 31, 1847, Kintner probably did not finish it until sometime in November. The final payment, on March 18, 1848, indicated that he received $500.00 for the house, $230.00 for the kitchen, $15.00 for plastering the attic, and $5.00 for an outhouse. No site was indicated for the dwelling and outhouse, but it was undoubtedly on the east bank of Mine Brook on the level terrace above the Delaware River. Although the contract did not indicate that a barn was also built, such a building must have been erected because the company kept several horses at the site.[25]

In addition to employing mostly local men as laborers, the Alleghany Mining Company leadership obtained most of the supplies from the area residents. Moses Shoemaker supplied grain (rye) and hay for the company horses. A number of other items such as blasting powder, numerous candles, and matches were purchased from the Brodhead Brothers store which was probably located in nearby Stroudsburg, Pennsylvania. Candles

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24. Drinker, *Tunneling, Explosive Compounds, and Rock Drills*, 108-109.

25. "Proposal by the Alleghany Mining Company of the following described Dwelling House to be put out to the lowest bidder," June 24, 1847, Charles Bartles papers, Box 33, Folder 2108; Alleghany Mining Company to Jonas Kintner, March 18, 1848, Charles Bartles papers, Box 33, Folder 2109.

probably served as the means to illuminate the underground work. Some supplies, such as cast steel drills, came from Flemington.[26]

The Alleghany Mining Company directors had the copper impregnated sandstone placed in wooden barrels and hauled by horse-drawn wagon to Flemington, New Jersey. Charles Bartles owned a copper mine at Flemington where a mill and smelter were located.[27]

Copper prospecting at Pahaquarry seemingly ceased about the end of March 1848, since payrolls do not exist after that time. In all likelihood, the poor copper content of the low-grade ore brought the operation to a halt. Receipts in the Bartles papers show that he and Peter Clark continued to sell stock through June 1848. Bartles faced the same situation with his Flemington mine which also produced little copper ore. After the search for ore ceased at Flemington, Bartles focused on selling stock in that company as the means of making money. Consequently, he undoubtedly used the same approach for the Pahaquarry mine. A further indication that exploration ceased by the end of March 1848 can be seen by the fact that by April 1849 James Reading sold some of his stock in the Alleghany Mining Company. In May 1852 Henry Shoemaker wrote to Bartles and stated that he had not seen him or heard from company officials in some time. He asked what they intended to do with the house that he then occupied. No reply can be found in the Bartles papers.[28]

At the end of 1860, Jesse Godley of Philadelphia wrote to Peter I. Clark and inquired about the Alleghany Mining Company. Toward the end of November of that year Clark replied to Godley's letter. Again in December, Godley wrote to Clark who answered later that month and informed Godley that the Alleghany tract consisted of 488 acres. This correspondence resulted in the sale of the Alleghany Mining Company to Godley and his partners by September 1861. (See 1753-1912 Property Ownership Map.) The purchase of the company coincided with increased copper prices during the Civil War period. On March 24, 1862 the Alleghany Mining Company was reorganized with double the capital. Jesse Godley became the president while his brother William presided as treasurer and registrar. Other corporate members included Stacey Bancroft, Joshua M. Butler, Marmaduke Moore, Charles P. Bayard, Henry Godley, and George H. Hunt.[29]

The new Alleghany Mining Company management began to purchase more land in September 1861. The additional land acquisition included five lots with a total of 1,271

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26. Payment to Moses Shoemaker, July 31, 1847 and August 1847, Charles Bartles papers, Box 33, Folders 2104 and 2106; Alleghany Mining Company account with Brodhead Brothers, Charles Bartles papers, Box 33, Folder 2109.

27. Payment to John C. Mickle for hauling ore to Flemington from July 7, 1847 to August 1, 1847, Charles Bartles papers, Box 33, Folder 2105; Payment for 25 casks for packing ore, September 18, 1847, Charles Bartles papers, Box 33, Folder 2106.

28. James N. Reading stock sale, April 17, 1849, Charles Bartles papers, Box 33, Folder 2102; Henry Shoemaker to Charles Bartles, May 17, 1852, Charles Bartles papers, Box 7, Folder 404.

29. Peter I. Clark to Jesse Godley, November 21, 1860; Peter I. Clark to Jesse Godley, December 27, 1860, Charles Bartles papers, Box 10, Folder 584; Dickeson, *Report of the Geological Survey and Condition of the Alleghany Mining Company's Property, Warren County, New Jersey*, 27.

acres from Peter I. Clark on September 19, 1861. Clark had obtained three of these lots at the 1846 sheriff's sale. Lots 4 and 5, that respectively contained 350 and 118 acres, had been bought by Clark on September 5, 1846 from John Johnson's heirs.

Bartles also sold his seventy-one acres, that contained the adits and prospect holes, to the new corporation owners on September 19, 1861. In the next month, on October 13, 1861, the company obtained 33.75 acres that fronted on the Delaware River from John Shoemaker. Finally, on December 5, 1861, James N. Reading sold 195 acres to the Alleghany Mining Company.[30]

The new Alleghany Mining Company directors hired Montroville Wilson Dickeson, an economic geologist from Philadelphia, to survey the property and produce promotional literature. Dickeson specialized in writing promotional literature for copper mines with at least a half-dozen publications on other East Coast mines. In his report (Appendix B), which he completed on December 20, 1861, Dickeson stated that the mountains were covered with a "luxuriant" growth of heavy chestnut, and white and black oak timber. He described the remains from previous prospecting activity. In addition, he noted the current operation. Miners had constructed a windlass frame covered by a shed over a 1847-48 mine shaft (number 5 - see Illustration 8, Enlargement of a Portion of Dickeson's 1862 Drawing of the Alleghany Mining Company's Property) and had begun to dig beyond its original fifteen feet depth. By April 1862 the men had reached a depth of fifty-nine feet. Dickeson noted one other shaft (number 14 – see Illustration 8, Enlargement of a Portion of Dickeson's 1862 Drawing) that had been excavated to a depth of fifteen feet on the third terrace during the 1847-48 period. By January 1862 this shaft had been extended to twenty-five feet. As stated earlier, this shaft was undoubtedly covered by tailings during the early twentieth century. Dickeson also noted that there were several openings across Mine Brook to the northeast. Two roads permitted access to the excavation sites. One passage traversed the Mine Brook ravine, while the other road meandered from the river to the higher areas. Dickeson wrote that the ore could be transported by boat to Philadelphia or hauled by wagon to nearby canals or railroads that would deliver the ore to New York. The company made use of several buildings along the river, including a dwelling-house, that remained from the 1847-48 prospecting period. In 1861, the Alleghany company directors constructed one other building, an ore house of unknown location, on their land. In addition, the property contained about thirty acres which had been partly cleared and fenced. This land undoubtedly comprised the 33.75 acre lot on the first river terrace that was originally known as the Van Gordon tract.[31]

Spurred by Dickeson's assessment that the property contained an abundance of very rich copper ore, the Alleghany Mining Company officials continued with its development in

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30. Peter I. Clark and Wife Cynthia to the Alleghany Mining Company, September 19, 1861, Warren County Deed Book 53, pp. 268-270; Charles Bartles to the Alleghany Mining Company, September 19, 1861, Warren County Deed Book 53, pp. 267-268; John V. Shoemaker and Wife Elizabeth to the Alleghany Mining Company, October 13, 1861, Warren County Deed Book 53, pp. 438-440; James N. Reading and Wife Sarah to the Alleghany Mining Company, December 5, 1861, Warren County Deed Book 53, pp. 436-438.

31. Dickeson, *Report of the Geological Survey and Condition of the Alleghany Mining Company's Property, Warren County, New Jersey*, 3-11, 28-29; Mrs. Horace G. Walters, "The Delaware Shawnee to Walpack," (October 1941) 1-2, Typescript in the Delaware Water Gap National Recreation Area files, folder History Local, Miscellaneous. In older times, buckets of rock were hoisted by windlass using oxen.

early 1862. After a visit in January 1862, Dickeson noted that about a half ton of ore had been placed in barrels and awaited shipment downriver at the first opportunity. By April of that year, Dickeson advocated repairing one of the old dams and the mill race along with erecting a stamp mill. The ore, however, proved too low in copper content to sustain a successful operation and, by the end of 1862, the Alleghany Mining Company had ceased its activity. On April 3, 1867, the company sold its land, except for the mineral rights, to Aaron Keyser who owned a tannery in northern Knowlton township just below the Water Gap. Keyser's main interest was to obtain oak and hemlock bark for use in tanning hides. In 1868, the New Jersey State Geologist, George Cook, visited the Pahaquarry mines. He noted several points along the ravine where a search had been made for copper. He described one adit which extended about 150 feet into the hillside in a southwesterly direction and then turned northwest (number 1 – see Illustration 8, Enlargement of a Portion of Dickeson's 1862 Drawing). Since it had only been dug to a length of fifty to 100 feet in the 1750s, the Alleghany company evidently elongated this adit in the 1847-48 period. Cook also viewed an inclined shaft (number 3 – see Illustration 8, Enlargement of a Portion of Dickeson's 1862 Drawing) located above the adit. He concluded that the lack of mining success caused him to believe that "there is no inducement to warrant further outlays of capital in developing a paying copper mine."[32]

AN ERA OF TIMBERING 1867-1890S

Aaron Keyser bought the Pahaquarry property for its timber. Specifically, he sought the bark from the oak and hemlock trees to support his tannery that was located in nearby northern Knowlton Township. After he had cut an area, he would attempt to sell it, but he had little success in selling the Pahaquarry land. On June 10, 1875, Keyser, however, did sell 33.75 acres to Oliver Courtright which was the only good farm land that he owned in the area. By the time of the next mining period (1901-1912), only small diameter, second growth trees occupied the land near the mine sites. In the late 1870s, Aaron Keyser moved to Salt Lake City, Utah, and, at an undetermined date, thereafter abandoned the unsold, cut Pahaquarry land. Since the Alleghany Mining Company still controlled the mineral rights to the land sold to Keyser, Warren county officials evidently reached an agreement with that company to resume the land ownership. Although no deed indicates such a transaction, the property did come under Alleghany Mining Company control sometime in the 1890s. By the 1890s, Philip Godley of Philadelphia had become the principal stockholder of the Alleghany Mining Company. With rising copper prices in the 1890s, Godley may have seen a potential to sell the land.[33]

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32. Dickeson, *Report of the Geological Survey and Condition of the Alleghany Mining Company's Property, Warren County, New Jersey*, 12, 29; George H. Cook, *Geology of New Jersey* (Newark: Printed at the Daily Advertiser Office, 1868) 680; Alleghany Mining Company to Aaron Keyser, April 3, 1867, Warren County Deed Book 90, pp. 318-322, Warren County Courthouse, Belvidere, New Jersey.

33. Aaron Keyser to Oliver Courtright, April 1, 1876, Warren County Deed Book 96, pp. 483-484, Warren County Courthouse, Belvidere, New Jersey; Mrs. Horace G. Walters, "The Delaware Shawnee to Walpack" (October 1941), typescript in the Delaware Water Gap National Recreational Area files, folder – History Local, Miscellaneous.

PAHAQUARRY MINING IN THE TWENTIETH CENTURY 1901-1912

The rapid increase in the use of electricity, especially after the inventions of Thomas Edison in the 1870s and 1880s, caused the demand for copper wiring to skyrocket. By the turn of the twentieth century, the opening of mines in the Far West, especially in Arizona, Montana, and Utah, caused great profits. Demand, with reports of great wealth, combined to create a new speculative mania in copper mines. Old mines in the East received renewed attention. On March 9, 1901, Philip Gedley entered into a one-year agreement with Henry D. Deshler of Belvidere, New Jersey which permitted Deshler to enter the Pahaquarry land on April 1 "to search for and dig, excavate, mine and carry away for analysis all kinds of ore and minerals and to erect on said land, buildings, fixtures and machinery of all kinds that may be needed to prospect ore." During that year, Deshler had the option to purchase the land for $5,000 plus 5,000 shares of stock at $1.00 per share in any company that he may form for mining. Henry Deshler and his brother Oliver were no strangers to mining. On December 30, 1897, they had founded the Montgomery Gold Leaf Mining Company to search for gold in the nearby Tott's Gap area of Pennsylvania. Lack of success in this venture undoubtedly led them to the Pahaquarry site where they hoped to prosper. Consequently, on March 16, 1901, they increased the capital stock of the Montgomery Gold Leaf Mining Company from $250,000 to $500,000 in anticipation of their new mining venture.[34]

In their exploration for minerals, the Deshler brothers hired men to dig a new adit (Historic Photo 1) into the hillside below adit number 1 with the result that, by the end of 1901, they had extracted 100 tons of rock. Mining technology had improved to the point that mechanical drills replaced the labor-intensive hand drilling and dynamite supplanted black powder for blasting. Although this copper-bearing rock proved too low grade to pay for hauling it some seven miles by wagon to the nearest railroad, they evidently thought the mine held potential. Consequently, by late 1901, the Deshlers raised $158,000 for their venture from stock sales. They also purchased the 33.75 acres of land, formerly owned by the Alleghany Mining Company, from Oliver Courtright on December 17 of that year.[35]

On March 19, 1902 the Alleghany Mining Company entered into receivership. The New Jersey Court of Chancery appointed L. DeWitt Taylor as receiver and ordered him to sell the land and mineral rights. As the only bidder, the Montgomery Gold Leaf Company purchased the property for $2,500 on May 28, 1902. The land consisted of four tracts. Tract 1 contained the 1,271 acres of the five lots sold by Peter I. Clark to the Alleghany Company on September 9, 1861. Tract 2 comprised seventy-one acres received from Charles Bartles on that same date. Tract 3, a 7.5 acre parcel, had been sold to the Alleghany Mining Company by Moses Shoemaker on May 19, 1847. Tract 4, which

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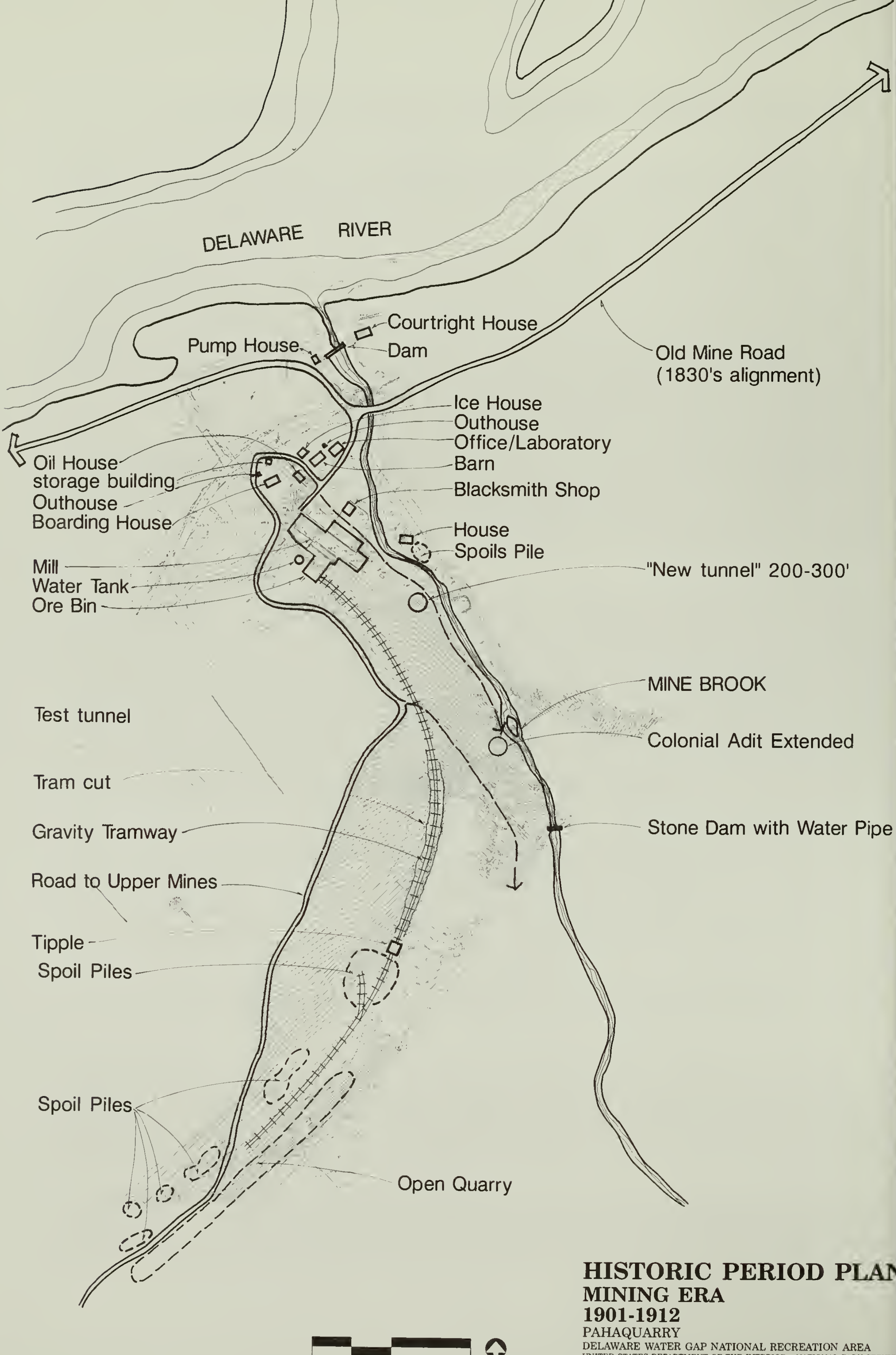
34. Agreement between Philip Godley and Henry D. Deshler, March 9, 1901, Warren County Agreement Book No 2; Certificate of Incorporation of the Montgomery Gold Leaf Mining Company, December 30, 1897, Warren County Corporation Book 3, Warren County Courthouse, Belvidere, New Jersey; Certificate of Increase of Capital of the Montgomery Gold Leaf Mining Company, March 16, 1901, Pahaquarry Copper Company reports, B538 7091-1812, New Jersey Department of State, Commercial Recording Division, Trenton, New Jersey.

35. *The Engineering and Mining Journal* 72(December 28, 1901) 865; "Pahaquarry Mine," *Geological Survey of New Jersey: Annual Report of the State Geologist for the Year 1901* (Trenton: MacCrellish & Quigley, 1902) 160-161; Oliver Courtright and wife to the Montgomery Gold Leaf Mining Company, December 17, 1901, Warren County Deed Book 173, pp. 673-674, Warren County Courthouse, Belvidere, New Jersey.



HISTORIC PERIOD PLAN
MINING ERA
1901-1912
PAHAQUARRY
DELAWARE WATER GAP NATIONAL RECREATION AREA
UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE
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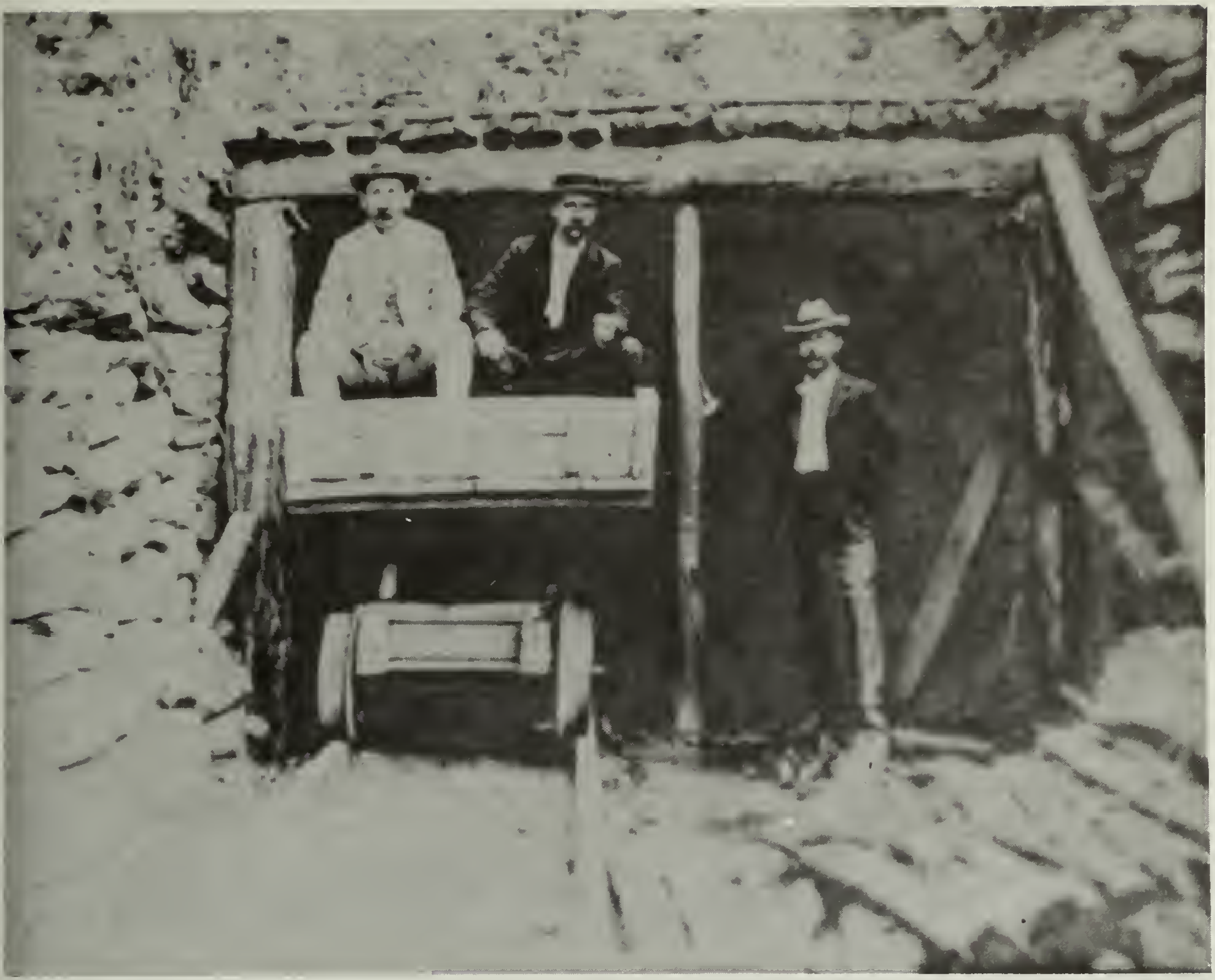

Historic Photo 1: Entrance to the New Adit Begun in 1901
Photo Dated 1910
Courtesy of Don Pace, Easton, Pennsylvania

contained 195 acres, had been obtained from James N. Reading on December 5, 1861. (See 1753-1912 Property Ownership Map.)[36]

To support the mining operation, the company officials began to construct buildings in a cleared area at the mouth of the Mine Brook ravine. The exact construction dates for some buildings are not known, but housing for the workforce may have been erected in 1901. (See 1901-12 Historic Period Plan.) Other buildings, such as the powder house, blacksmith shop with steam-heat boiler, barn, oil house, ice house, and office building which contained a laboratory, (Historic Photos 2-8), seemingly were not constructed until work had begun on a mill in the 1904-06 period. A new dam was built on Mine Brook to supply water (Historic Photo 9).

The Montgomery Company continued to extend its new adit and, by the end of 1903, it had penetrated some 240 feet into the hill. This copper ore continued to be too low grade. The new adit, however, was extended to 300 feet before it was abandoned. Company officials also had the workforce extend adit number 1. A concrete pad near the entrance gives evidence that a gasoline engine driven generator was probably placed on it to operate the drills. In addition to power drills, workers undoubtedly used electric blasting by which dynamite was ignited with electric current from a small hand detonator. An adjacent leveled area probably provided room for a tool shed or some other support function. This adit also yielded only low-grade ore that would not have been suitable to mill. Additionally, workers drove a short, unsuccessful test adit into the hillside off a lower bench southwest of Mine Brook. Consequently, the Deshlers probably reached a decision point on whether to continue the operation or abandon the site. In 1904, they decided to install an experimental concentration process, developed by Dr. Nathaniel Shepard Keith, that seemingly held promise of making a profit from the low-grade ore. As a former advisor to Thomas A. Edison, Keith had gained recognition for his development of the use of electricity in metallurgy. Although his new experimental method to extract copper from ore did not use electricity, the Deshlers obviously decided that they could not go wrong by using a method devised by a man of Keith's reputation. With this encouragement, the Montgomery Gold Leaf Mining Company leadership decided to reorganize under another name more fitting for their copper mining operation. On August 20, 1904 they reinstituted the concern as the Pahaquarry Copper Company. Still controlled by Henry D. Deshler and his brother Oliver R. Deshler, the management decided to build a concentrating mill (Historic Photo 10) to accommodate Keith's machinery (see 1901-12 Historic Period Plan).[37]

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36. Alleghany Mining Company to the Montgomery Gold Leaf Mining Company, May 28, 1902, Warren County Deed Book 173, pp. 674-677, Warren County Courthouse, Belvidere, New Jersey; *The Engineering and Mining Journal* 73(May 31, 1902) 773.

37. "Pahaquarry Mine," *Geological Survey of New Jersey: Annual Report of the State Geologist for the Year 1903* (Trenton: MacCrellish & Quigley, 1904) 111; *Public Ledger* (Philadelphia), January 28, 1925; Certificate of change of Name of Montgomery Gold Leaf Mining Company to Pahaquarry Copper Company, August 20, 1904, Warren County Corporation Book 3, Warren County Courthouse, Belvidere, New Jersey and also found in the Pahaquarry Copper Company reports, B538 7091-1812, New Jersey Department of State, Commercial Recording Division, Trenton, New Jersey.

Historic Photo 2: View of the Office, Blacksmith Shop, Barn, Ice House, Mill, Tipple on the Hill, and Boarding House Ca. 1910
Courtesy of the Delaware Water Gap National Recreation Area

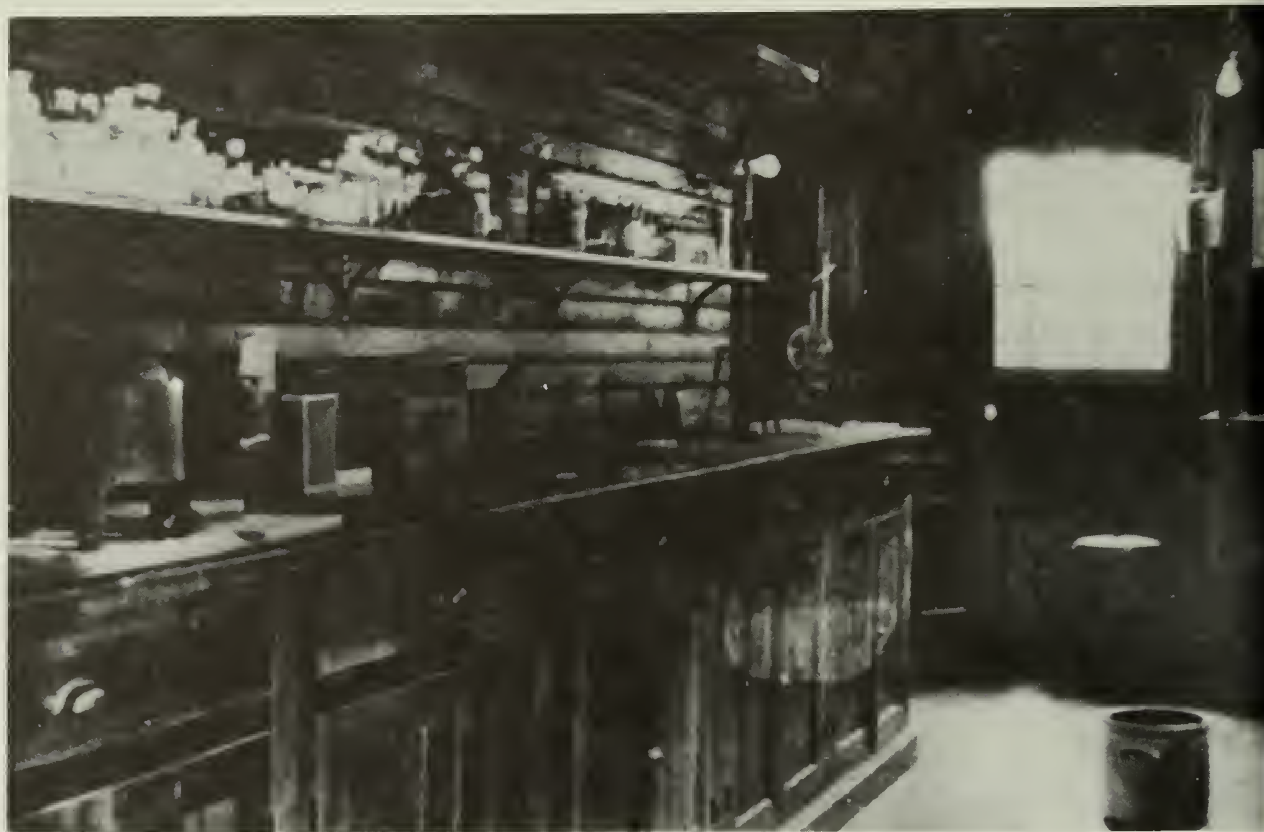
Historic Photo 3: View of the Boarding House, Oil House, Ice House, and Barn Ca. 1910
Courtesy of the Delaware Water Gap National Recreation Area

Historic Photo 4: View of the Barn and Office Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

Historic Photo 5: View of the Boarding House Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

Historic Photo 6: View of the Barn, Office, and Courtright House in Background Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

Historic Photo 7: Blacksmith Shop Interior Ca. 1910
Courtesy of Pat Fishler, Bangor, Pennsylvania



Historic Photo 8: Laboratory Interior Ca. 1910
Courtesy of Pat Fishler,
Bangor, Pennsylvania

Historic Photo 9: The Twentieth Century Dam Ca. 1910
Courtesy of Delaware Water Gap
National Recreation Area

In 1905 through the summer of 1906, no excavation occurred at the Pahaquarry site as the company owners directed their effort at building the mill in which the copper-bearing ore would be treated by Keith's method. In March 1906 the Deshlers placed an order with the Colorado Iron Works Company of Denver, Colorado for milling machinery that included two sets of 16-x 30-inch standard rolls, four sets of 10-x 30-inch standard rolls, and twenty-two impact screens (Illustration 11). Additional equipment included twin gas producers (Historic Photo 11) and a gas engine from the Weber Gas Engine Company of Kansas City, Missouri to power the mill, as well as Frue vanners for concentration.[38]

To process the ore, the mill was designed with several levels similar to gravity flow mills of the period. The raw ore entered the mill from the top where the rock was ground. It passed to an intermediate level for further processing, and finally was sent to the lowest section for concentration. At the top of the mill the Deshlers installed a gyratory crusher which, as the first step, produced a coarse-ground ore. This coarse-ground ore passed to impact screens where the larger pieces were separated from the finer components. The coarser portion returned to a crusher for further processing while fine ground ore proceeded to a hopper where coal was added to achieve a three-percent mixture. From the hopper, the ore and coal mix was fed to grinding rolls which reduced the ore to a fineness that passed through a Number 30 mesh sieve. The powdered ore passed into another hopper from which it entered a twenty-foot-high circular brick furnace located in an adjacent mill section placed there as a measure for fire protection. This furnace set atop an inclined shaft that connected with a vertical shaft which served as a condensing chamber. The pulverized ore, mixed to three percent with powdered coal, was fed into the top part of the furnace shaft through 200 small holes. Each hole had a gas burner fueled with producer gas. These holes resembled an inverted Bunsen burner with the powdered ore passing through the flame. The coal caused the ore powder to ignite with the supposed result that the copper would turn to globules and fall past the inclined shaft into the vertical condensing chamber where it would be sprinkled with water. The cooled copper particles along with the remaining pulverized rock would then fall to the bottom of the condensing chamber and be carried by water to a concentrating table where the rock and metal would be separated. An exhaust fan produced a downward draft in the furnace that vented the dust and combustion gases into a second, twenty-foot-high stone-filled scrubber tower (see Appendix C).[39]

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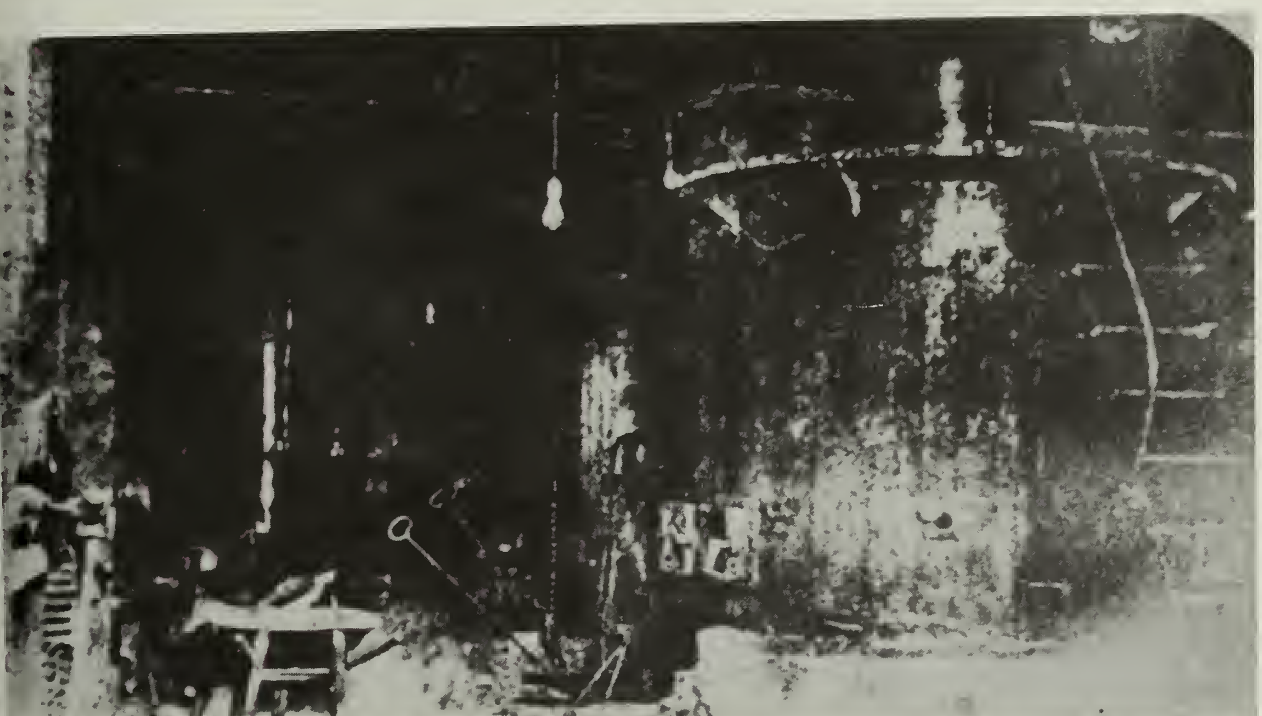
38. *The Copper Handbook: A Manual of the Copper Industry of the World, 1906* (Houghton, Mich.: Horace J. Stevens, 1906) 797; "Pahaquarry Copper Mine" *Geological Survey of New Jersey: Annual Report of the State Geologist for the Year 1908* (Trenton, N.J.: MacCrellish & Quigley, 1909) 134.

39. N. S. Keith, "New Methods in the Metallurgical Treatment of Copper Ores" *Journal of the Franklin Institute* 160(August 1905) 153-155; N. S. Keith, "The Copper Deposits of New Jersey" *Mining Magazine* 13(June 1906) 474-475; Walter Harvey Weed, "Copper Deposits of the Appalachian States," United States Geological Survey Bulletin 455 (Washington, D.C.: Government Printing Office, 1911) 57; William Lee Phyfe, "Copper Deposits of New Jersey" (Princeton University Senior Thesis, 1933) 156.

Historic Photo 10: The Mill in 1905



Historic Photo 11: The Producer Gas System Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

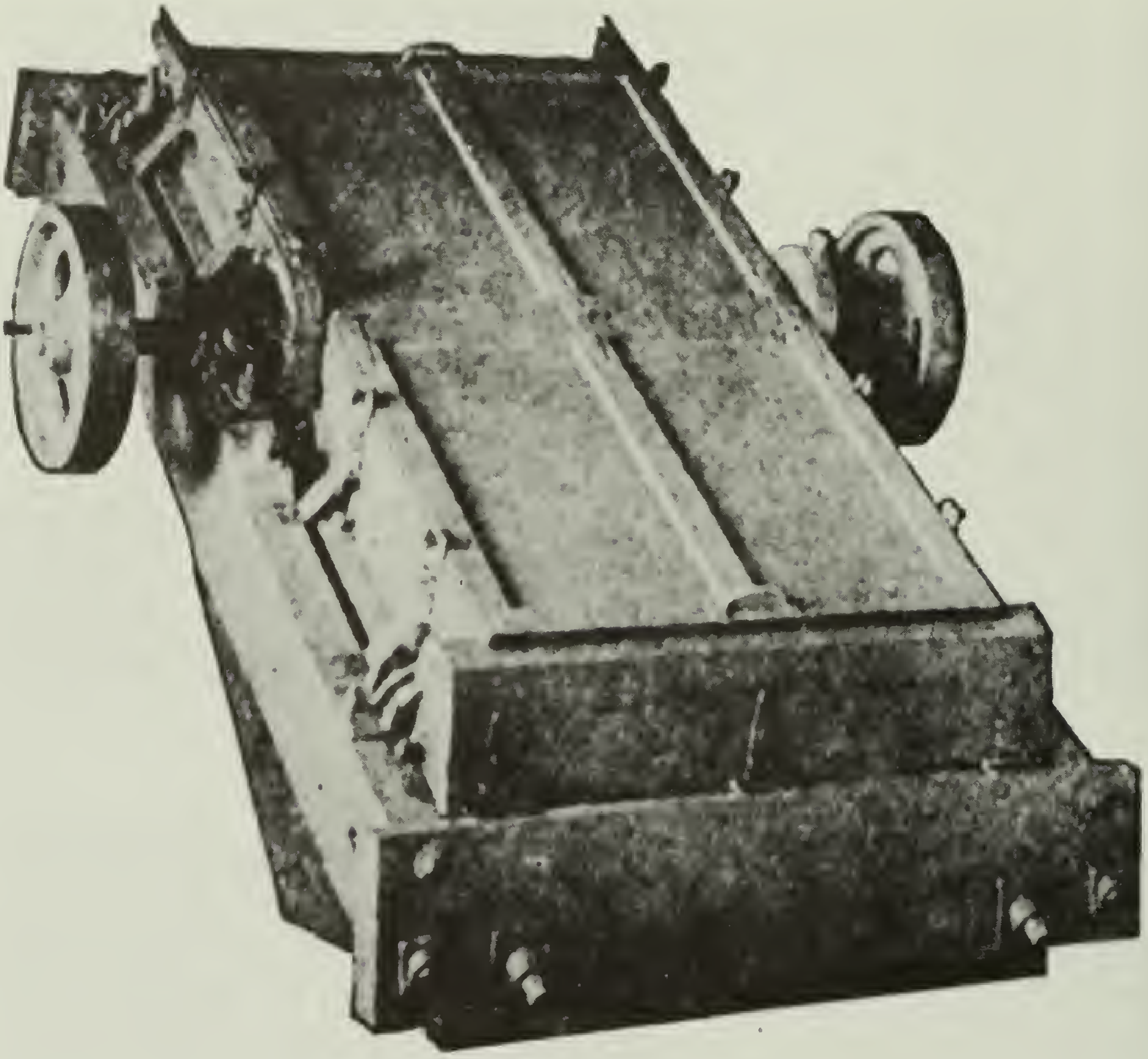


Illustration 11: Colorado Iron Works Company Impact Screen

An impact screen separated course ground ore from fine ground ore. Built with a slope, the partly crushed ore entered an impact screen, where, by shaking, the screen gave the ore a dancing movement which caused the coarser ground ore to move to the top where it was sent for further grinding. The fine ground ore moved to the bottom of the screen where it was sent to grinding rolls for pulverizing.

Although no adit work occurred at Pahaquarry through most of 1905-06, the company leadership continued to prospect the area. They recognized that the copper ore bed outcropped on the hill in back of the adits. This situation made it easier to quarry the ore from an open cut (Historic Photo 12) rather than continue to search for ore in underground sources. Mining technology had also progressed by this time to permit such an operation. As a result in 1906, a decision was made to build a tipple near the quarry and transport the ore bearing rock in self-dumping cars some 2,500 feet on a double-track gravity tramway to a 1,000 ton storage bin located on a hill above the mill (Historic Photos 2, 13-15). The tramway track entered the storage bin on a twenty-foot-high trestle. This decision to construct a tramway and erect a storage bin on the hill meant that the mill had to be reconfigured in order to allow for the gravitational feed of ore from the storage bin into the mill's crushing equipment. Consequently, the mill roof was removed and another story was added to the mill (compare the mill in Historic Photo 16 with the mill in Historic Photo 10 and see Historic Photos 2, 17-19).[40]

Owing to a need to rearrange the mill layout with the construction of the ore bin on the hill, Keith's mill was not completed until the end of 1908. Unfortunately, Dr. Keith's experimental ore concentration method failed to work. The company officials admitted that they needed to alter the mill equipment.[41]

While preparing to alter the mill, the Deshlers shipped a carload of sorted ore to New York at the end of September 1909 to be tested. Since there was no railroad connection with the mine, the ore had to be teamed about seven miles to the nearest railroad junction. No results of the test have been found.[42]

A work crew spent the latter part of 1909 and much of 1910 in remodeling the mill. Some of Keith's equipment was removed to accommodate the latest in milling equipment which consisted of a flotation system and an ore dryer. Still in its infancy, the installation of a flotation system for the mill signified that the Deshlers had adopted another experimental procedure being developed for processing low-grade ore. The use of the flotation system to concentrate copper from chalcocite-bearing ore was not perfected until 1915. In this process, raw ore from the storage bin entered at the top of the mill into a 400-ton Austin gyratory crusher. The partly crushed ore then passed through low-speed coarse crushing rolls made by the Colorado Iron Works and into a circular rotary screen. By turning, the screen separated the smaller ore-bearing rocks from the larger ones. An elevator returned the larger ore pieces to the low-speed coarse crushing rolls to receive additional crushing. At the same time, the smaller pieces of rock were discharged into Colorado Iron Works high-speed fine crushing rolls located on the level below. From these high-speed rolls, the

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40. "Pahaquarry Copper Mine," *Geological Survey of New Jersey: Annual Report of the State Geologist for the Year 1908* (Trenton: MacCrellish & Quigley, 1909) 134; Keith, "Copper Deposits of New Jersey," 474-475.

41. "Pahaquarry Copper Mine," *Geological Survey of New Jersey: Annual Report of the State Geologist for the Year 1908*, 134; "Copper," *Geological Survey of New Jersey: Annual Report of the State Geologist For the Year 1909* (Trenton: MacCrellish & Quigley, 1910) 106.

42. *The Engineering and Mining Journal* 88(October 9, 1909) 754.

Historic Photo 12: The Quarry Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

Historic Photo 13: Looking down the Inclined Tramway Track toward the Ore Bin that was Located above the Mill
Courtesy of Delaware Water Gap National Recreation Area

Historic Photo 14: View Down the Tramway Track Ca. 1910
Courtesy of Delaware Water Gap
National Recreation Area

Historic Photo 15: A View of the Tipple from the Quarry Side
Courtesy of Delaware Water Gap National Recreational Area

Historic Photo 16: The Mill Ca. 1907
Courtesy of Don Pace, Easton, Pennsylvania

This photo shows the addition of another story to the mill to accommodate the new arrangement with an ore bin on the hill.

Historic Photo 17: The Mill with Electrical Generation and Producer Gas Addition, Blacksmith Shop, and Water Tank on Hill above the Mill Ca. 1910
Courtesy of Delaware Gap National Recreation Area

Historic Photo 18: The Mill with Ore Bin Behind It Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

Historic Photo 19: A View of the Mill with the Ore Bin behind It Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

finer ore-bearing rock dropped onto sixty-mesh impact screens. Any rock that could not pass through the sixty-mesh screens would be directed to Spitzkasten on the next to lowest level. These Spitzkasten were funnel-shaped boxes where water and compressed air was used to further separate fine and coarse-ground, sand sized particles of ore (Illustration 12 and Historic Photo 20) before conducting them to an Overstrom Colorado Iron Works Company concentrating table followed by a Traylor Engg concentrating table to recover the copper middlings. Ore that fell through the sixty-mesh screens went to Fairbanks-Morse automatic scales so the proper amount could be delivered to a flotation tank (Callow Tank) found on the next to lowest level of the mill. (J. M. Callow, the tank's inventor, had only begun his flotation experiments in early 1909.) In the flotation process, the ore was mixed with water and oil (probably one percent oleic acid) in the flotation tank. A mechanically driven agitator at the bottom of the tank kept the ore suspended in the water so that the oil would coat the surface of the copper particles and cause the fine mineral grains to float. In the meantime compressed air was induced into the tank to cause the water surface tension to break and produce bubble-laden froth. The oil in the water would not only adhere to the copper particles, but it would coat the bubbles to prevent them from breaking. This situation has been compared to a child with a bubble pipe. If one blew air into a pipe that contained pure water, the bubbles that are created would soon break. By putting soap into the water, the soap would coat the bubbles and prevents them from breaking as rapidly and, thus, the bubbles will float in the air. By this same principle, fine copper particles cling to the oily froth bubbles and flow with the bubbles over the tank side. These grains of ore with the froth were then delivered to the lowest mill level where they passed over four Colorado Iron Works Frue vanners (concentrating tables) in a process that produced a finished concentrate (Historic Photo 21 and Illustration 13). At the same time, the larger pieces of copper ore that managed to settle to the bottom of the flotation tank were released in water from the bottom of the tank to an Overstrom Colorado Iron Works Company concentrating table followed by a Traylor Engg concentrating table to recover the copper middlings as a finished concentrate. Other crushed rock was removed to the tail-race that led to the Delaware River. (See Historic Photo 22, Flow Chart Diagram drawn by Walter B. Deshler.) As the final step, the concentrated copper was taken to a dryer (Illustrations 14-16 show typical early twentieth century mill layouts).[43]

Other modifications were necessary to operate the new concentration process. The Mine Brook dam (Historic Photo 9) failed to provide adequate water for the flotation process during dry periods. As a result, the company constructed a pumphouse (Historic Photo 23) on the left bank of Mine Brook near the Delaware River and installed an Aldrich Triplex electric pump. Water was pumped from an adjacent reservoir contained by a concrete dam across Mine Brook as well as the Delaware River into a 13,000 gallon tank (Historic Photo 17) that was located on the hill above the mill. In addition an electrical plant replaced the gasoline engine as the power source for the mill. This generating machinery was dragged for seven miles on skids to reach the mill site. It consisted of a 3-cylinder, 350 horsepower, gasoline engine, manufactured by the Weber Gas Engine Company of Kansas City, Missouri, which drove a 722 K.V.A. generator (Historic Photo 24). An auxiliary power

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43. "Copper," *Geological Survey of New Jersey: Annual Report of the State Geologist For the Year 1909*, 106; *The Engineering and Mining Journal* 90(November 26, 1910) 1078-1079; T. A. Rickard, ed., *Concentration By Flotation* (N.Y.: John Wiley & Sons, Inc., 1921) 201-208; T. A. Rickard, *A History of American Mining* (N.Y.: McGraw-Hill Book Co., 1932) 407.

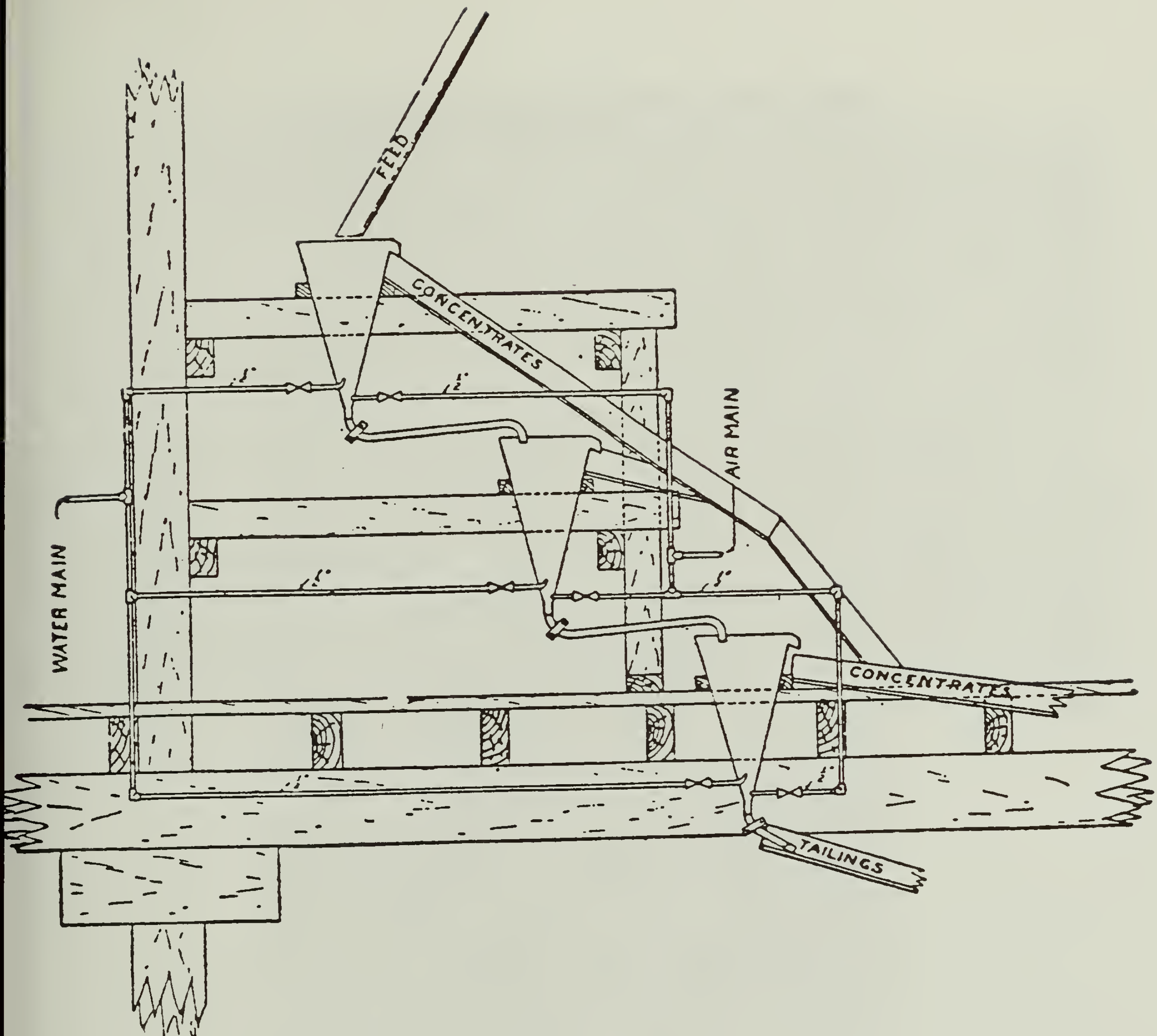
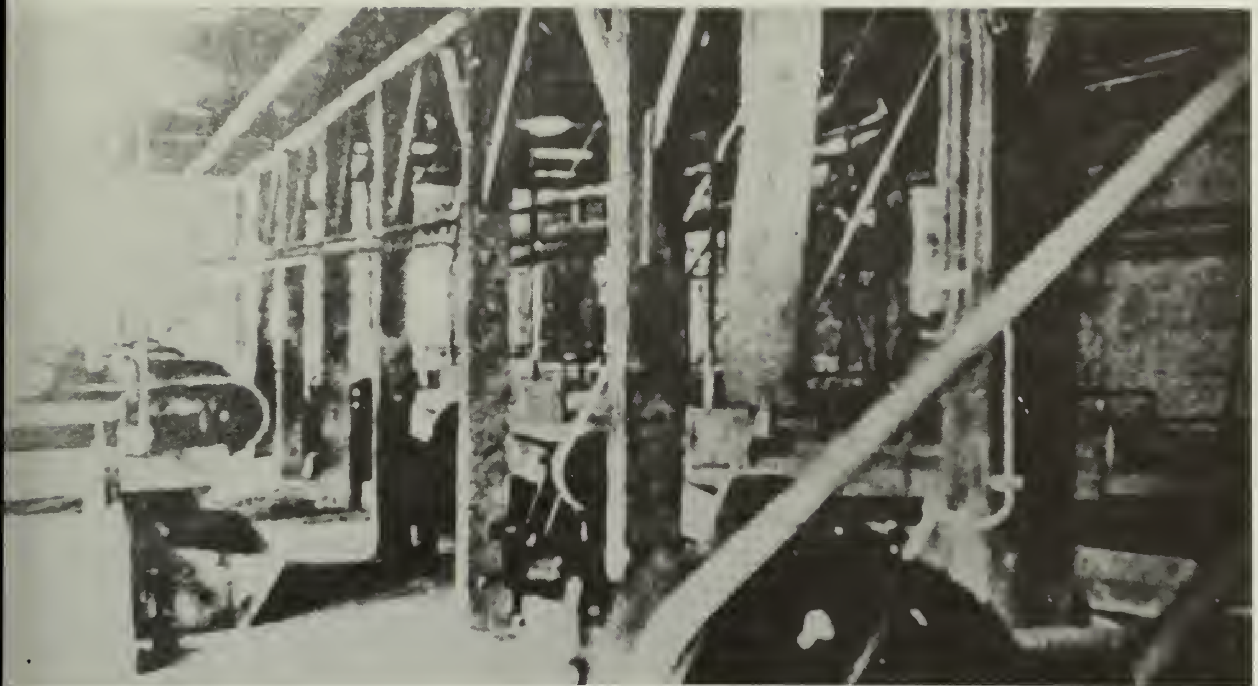


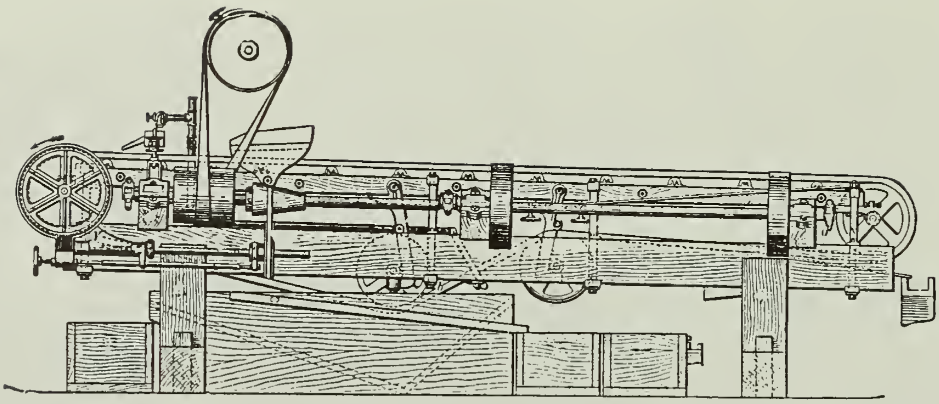
Illustration 12: Spitzkasten

Spitzkasten were funnel-shaped boxes designed to separate ore that had been ground to a consistency of fine and coarse sand. Each water filled Spitzkasten was supplied with compressed air that caused the finer ore particles to float to the top and enter a pipe that conducted them to concentrating tables for the recovery of copper middlings while the coarser pieces sank to the bottom and were conducted to the next Spitzkasten for further processing.

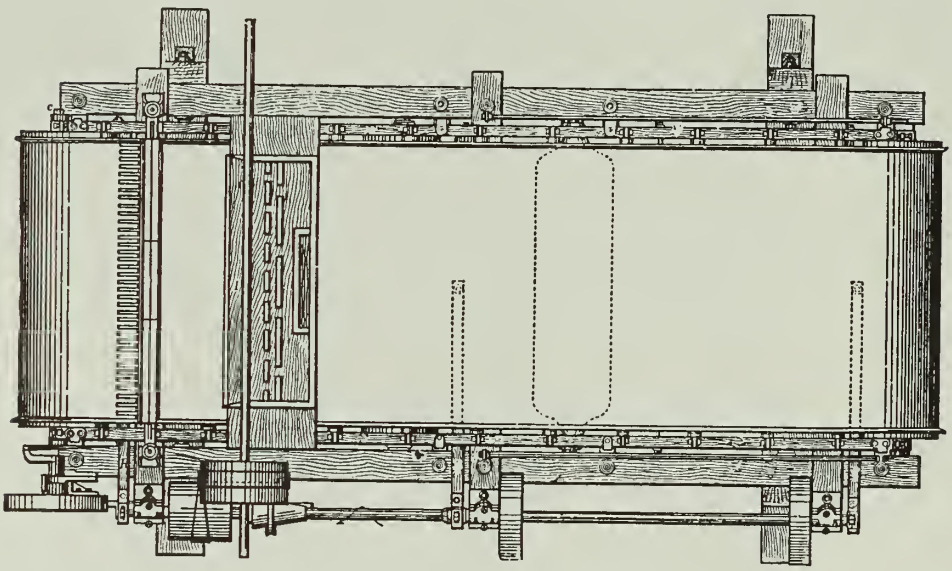
Historic Photo 20: A Spitzkasten appears at the left center of this interior photograph of the mill
Ca. 1910
Courtesy of the Delaware Water Gap National Recreation Area



Historic Photo 21: Frue Vanners (concentration tables) located on the lowest level of the mill Ca. 1910
Courtesy of the Delaware Water Gap National Recreation Area



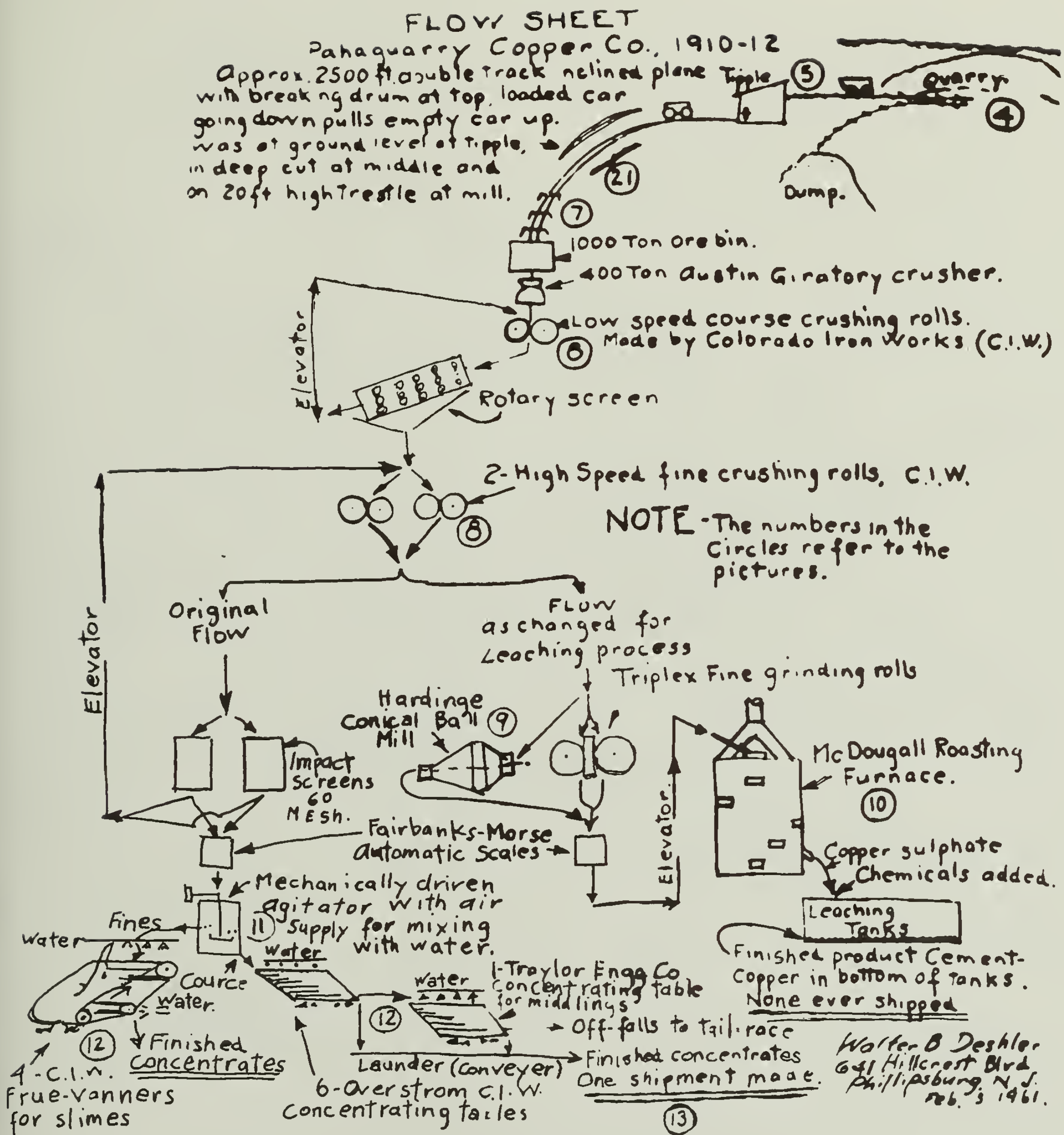
SIDE VIEW OF FRUE VANNER



OVERHEAD VIEW OF FRUE VANNER

Illustration 13: The Frue Vanner

This concentration device was developed by Dr. W. B. Frue in the mid-1870s. The main feature of the machine is an endless, inclined rubber belt (vanner), supported on rollers, that measures four feet wide by twelve feet long with rubber flanges on the sides. Its incline was usually three to five inches per foot. As the belt traveled up the incline at the rate of thirty-two inches per minute, it received a steady shaking from a crank shaft along one side of the machine. The ore is fed in a stream of water onto the belt about three feet from the upper end and flows slowly down the incline while subject to a steady shaking. The shaking deposits the mineral on the belt. As the deposited mineral traveled up the belt, it came into contact near the top with water sprayed onto the belt from a row of water jets. The water from the jets washed back the lighter non-mineral rock, letting only the heavier copper ore pass. The ore then fell off the upper end of the belt into a floor-level trough. At the same time the non-mineral rock was washed to the lower end of the belt and deposited in a trough from where it was taken to the tailings. Each Frue vanner had a capacity of five to ten tons per twenty-four hours. Consequently, a mill capable of processing 200 tons of ore per day, as the one at Pahaquarry, required a number of Frue Vanners.



Historic Photo 22: A Flow Chart Diagram Drawn by Walter B. Deshler of the Last Two Concentration Processes used at the Mill
Courtesy of the Delaware Water Gap National Recreation Area

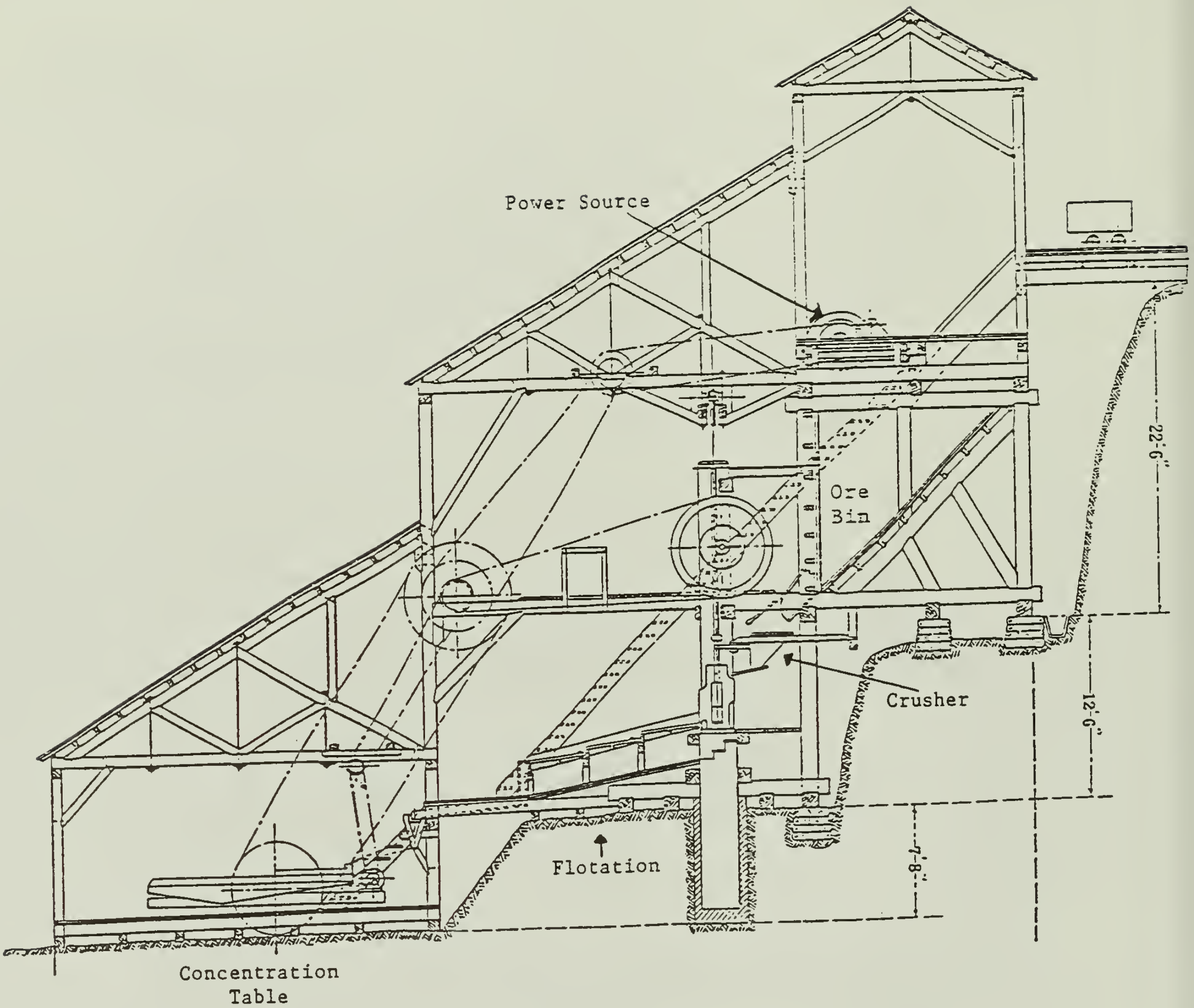


Illustration 14: Typical Early Twentieth Century Mill Layout
Mining and Scientific Press 80(May 5, 1902)

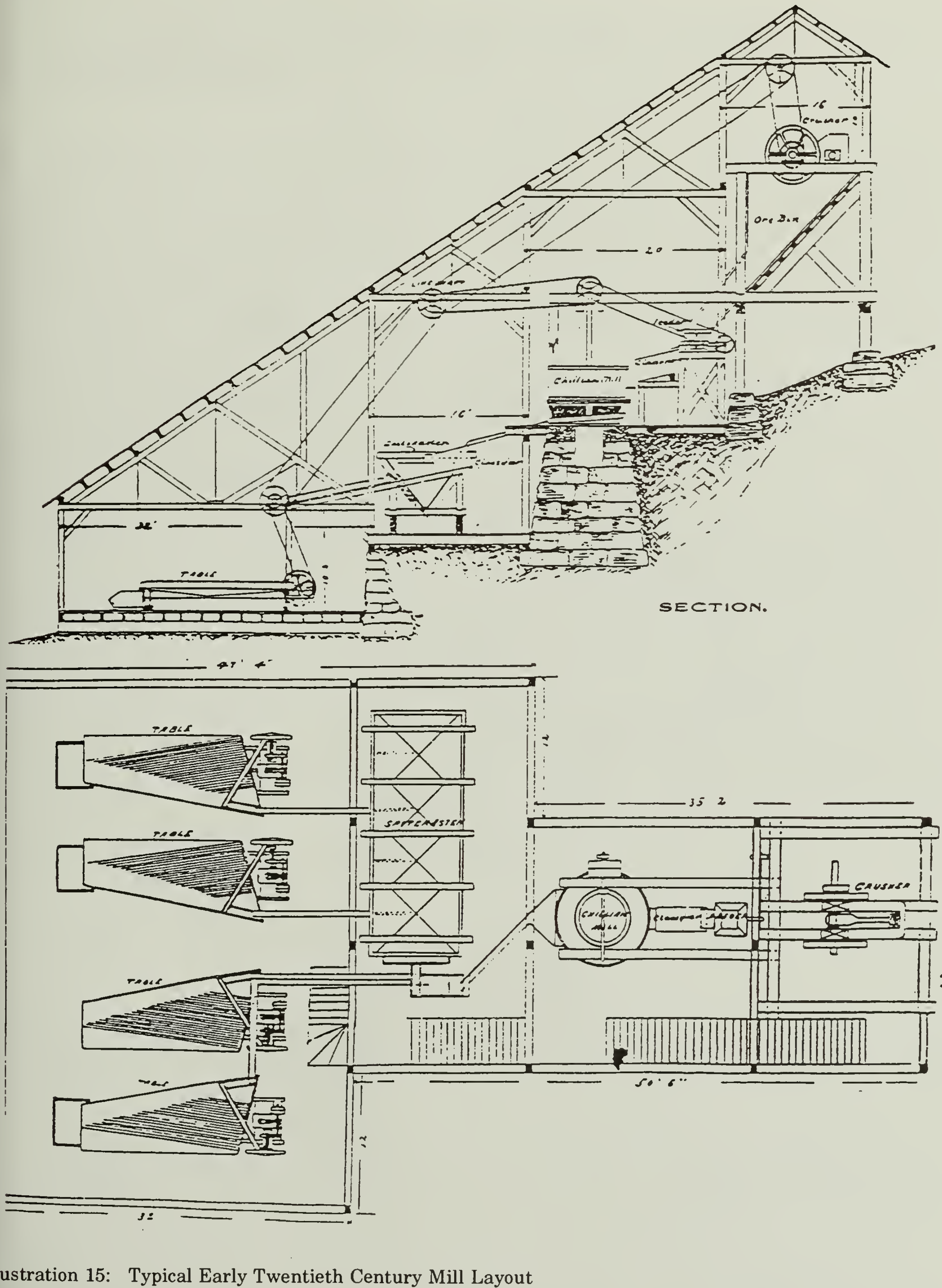


Illustration 15: Typical Early Twentieth Century Mill Layout
Mining and Scientific Press 80(May 5, 1902)

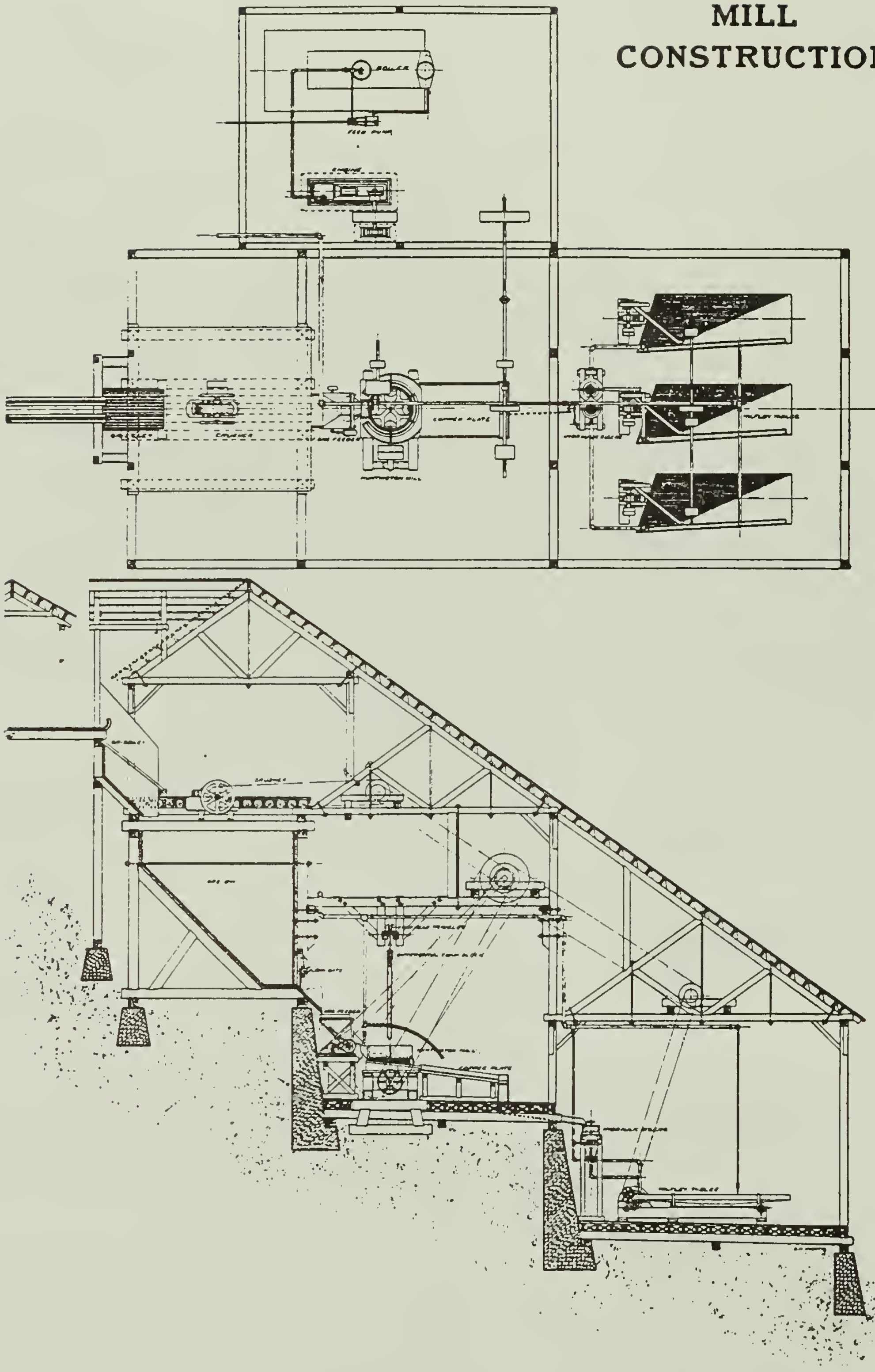


Illustration 16: Typical Early Twentieth Century Mill Layout
Mining and Scientific Press 80(May 5, 1902)

plant, which comprised a Fairbanks-Morse single cylinder gasoline engine, was belted to a Crocker-Wheeler direct current generator that supplied power to operate two Gardner electric rock drills. Finally, a Curtis compressed air system was installed as part of the flotation tank operation.[44]

In 1911, the miners quarried ore for three months, while the mill functioned for two months. Company officials lowered their estimate of the copper content of the rock from a previous statement of three to four percent to two percent. One copper mining publication viewed the percentage claim to be an overestimate. Work halted because the chalcocite ore broke too finely for profitable concentration by the flotation method. Much of the unrecovered copper flowed down the tail-race to the Delaware River. The company did ship a small amount of the concentrated ore to a smelter. At least three ingots of refined copper were produced from the shipment that had a value of less than $15.00 (Historic Photo 25).[45]

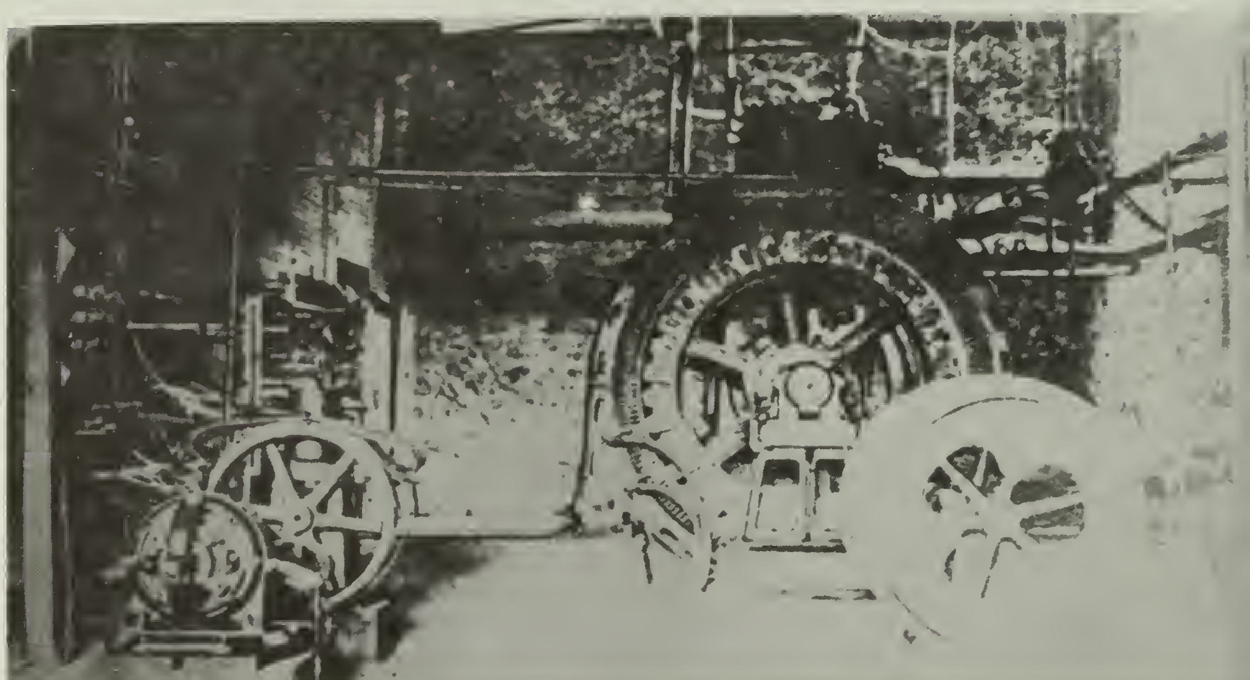
Suffering financial loss, despite having sold $494,156 of stock by 1911, company officials decided to install yet another concentrating system. By late 1911, Oliver's son George O. Deshler, the company engineer, adapted the plant with equipment for an older technological milling process to permit roasting and leaching the low-grade ore. The company officials retained the initial crushing process, but, after the ore passed through the high-speed fine crushing rolls, most of it was diverted to newly installed triplex fine grinding rolls. Larger pieces of rock, however, were directed to a Hardinge conical ball mill (Historic Photo 26) for further pulverizing. Crushed ore from the triplex fine grinding rolls and the Hardinge mill was collected on the Fairbanks-Morse automatic scales from which measured amounts were elevated to a McDougall Roasting Furnace (Illustration 17) by an automatic feeder. In the furnace, the pulverized chalcocite ore was gradually heated from 600 to 800 degrees as it passed through a series of six hearths. This preliminary treatment burned off part of the sulphur without fusing it to the copper. After roasting, it was further processed with a chemical leaching agent, most likely sulfuric acid or ammonia, in eight, wooden leaching tanks where the copper precipitated to the tank bottoms in the form of cement copper. This system, too, failed and the Deshlers were unable to obtain enough cement copper to ship to a smelter.[46]

44. *The Engineering and Mining Journal* 90(November 26, 1910) 1078-1079; Walter Renton Ingalls, ed., *The Mineral Industry: Its Statistics, Technology and Trade During 1909*, Vol. 18, (N.Y.: McGraw-Hill Book Co., 1910) 173.

45. *The Engineering and Mining Journal* 90(November 26, 1910) 1078-1079; "Pahaquarry Copper Company Prospectus, 1910-1912," 3; M. W. Twitchell, "The Mineral Industry of New Jersey for 1912" *Geological Survey of New Jersey Bulletin No. 11* (Trenton: MacCrellish & Quigley, 1913) 15; *The Copper Handbook: A Manual of the Copper Industry of the World, 1908* (Houghton, Mich.: Horace J. Stevens, 1908) 1098.

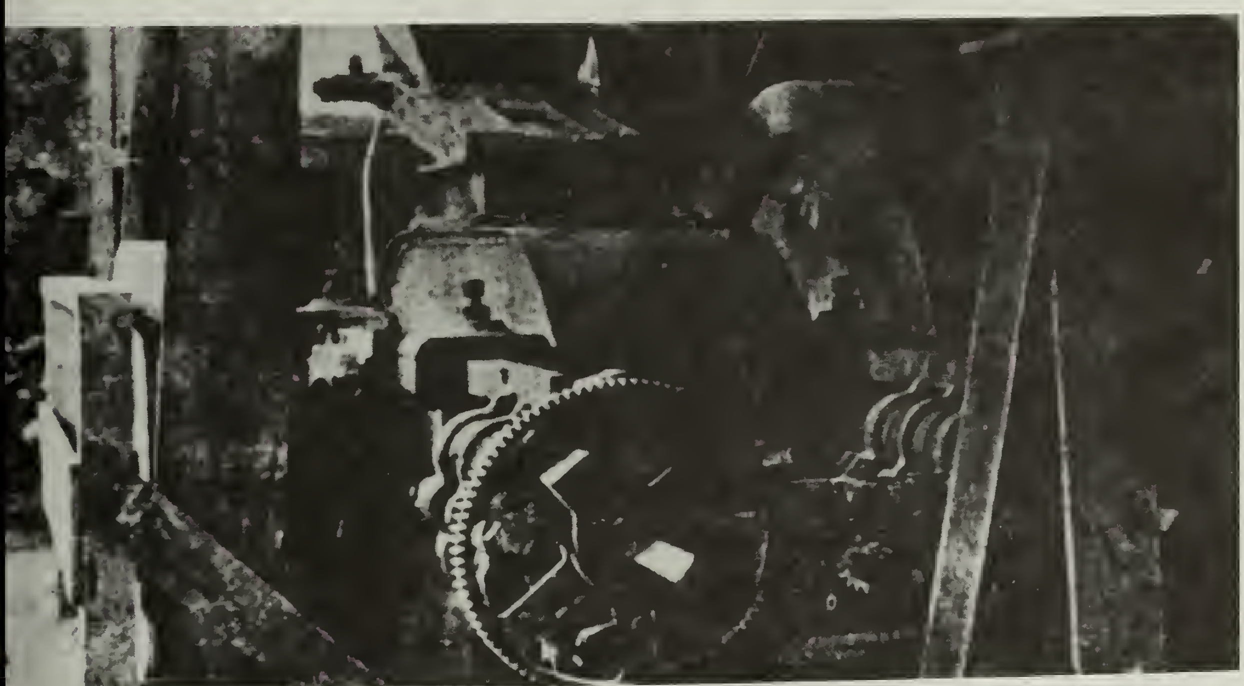
46. "Pahaquarry Copper Company Prospectus, 1910-1912," 3-4; Annual Report of the Pahaquarry Copper Company, May 6, 1911, Pahaquarry Copper Company reports, B538 7091-1812, New Jersey Department of State, Commercial Recording Division, Trenton, New Jersey; Twitchell, "The Mineral Industry of New Jersey for 1912," 15; J. Parke Channing, "Copper in the United States" *Cassier's Magazine* 22(July 1902) 261.

Historic Photo 23: The Pump House Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area



Historic Photo 24: Electrical Generating Equipment in the Mill Ca. 1910
Courtesy of Delaware Water Gap National Recreation Area

Historic Photo 25: Copper Ingot from the Pahaquarry Mine
Courtesy of Delaware Water Gap National Recreation Area



Historic Photo 26: A Hardinge Conical Ball Crusher
Courtesy of Delaware Water Gap National Recreation Area

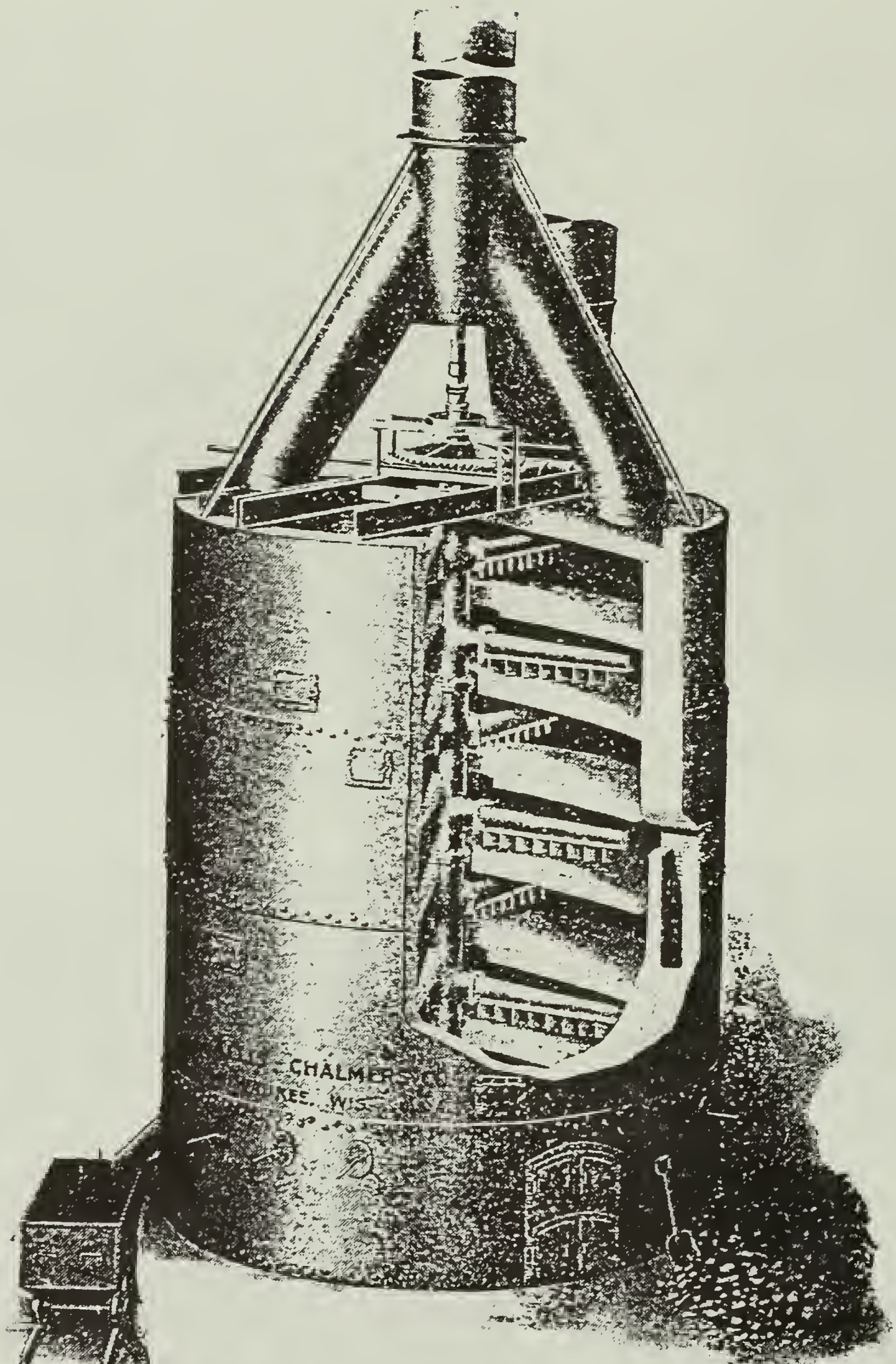


Illustration 17: A McDougall Roasting Furnace

THE END OF MINING OWNERSHIP 1913-1918

In 1913, with the third processing failure, the company desperately sought more funds. At a meeting on March 26, 1913, the directors voted to increase the capital stock from $500,000 to $750,000. Even this measure did not help the company and it was forced to cease operations. A newspaper later reported that between 1901 and 1913 the Deshlers had spent $275,000 on mining facilities. Judging from the amount of stock that the Deshlers sold, this figure was probably low. On September 29, 1913, upon complaint of Hugo Waldons, a creditor, the New Jersey Court of Chancery appointed Irvin N. Beavers of Reading, Pennsylvania, and George P. Young of Belvidere, New Jersey, as receivers for the bankrupt corporation. On June 20, 1916, the court ordered Beavers and Young to sell the property to the Delaware Valley Exploration Company for $10,000 subject to the payment by the purchasers of the mortgage debt, principal, interest and cost to the Easton Trust Company as trustees for the bondholders. Lacking no other offers, the receivers sold the property on February 10, 1917. Philip Godley, who had headed the Alleghany Mining Company, acted as president of the Delaware Valley Exploration Company. When the Delaware Valley Company failed to pay a $159,212.24 mortgage, the Easton Trust Company, which represented twenty-three individuals and three concerns, brought suit against both the Pahaquarry Copper Company and the Delaware Valley Exploration Company to recover the money. As a result, on July 29, 1918, the Court of Chancery of the State of New Jersey ordered that the property be sold at a sheriff's sale. On November 2, 1918, Dr. H. H. Wolford of Bangor, Pennsylvania bought the property for $30,250.[47]

ANOTHER ERA OF TIMBER CUTTING 1920-1922

Dr. Wolford sold the Pahaquarry land to Harry Deshler and his father Oliver on February 17, 1920 for $32,000. They mortgaged it to Henry A. Berendsen and his wife Hannah for $21,500. The Deshlers converted the lower part of the mill for a saw mill operation to manufacture railroad ties. They also constructed a brick building next to the old blacksmith shop for the manufacture of barrel staves. Timber for the operation came from the higher land on the opposite side of Mine Brook. Logs were dragged to the top of the hillside where they were rolled down the slope to a level area along Mine Brook that was later developed by the Boy Scouts as an Order of the Arrow ceremonial site. Logs were hauled from that area to the mill over a small railroad. The rails for this railroad probably came from the tramway track. In 1922, when the Deshlers could not make the mortgage

47. "Certificate of Increase of Capital Stock of Pahaquarry Copper Company," March 26, 1913, Pahaquarry Copper Company reports, B538 7091-1812, New Jersey Department of State, Commercial Recording Division, Trenton, New Jersey; *Newark Evening News*, July 5, 1924; *The Engineering and Mining Journal* 96 (October 25, 1913) 809; Walter Harvey Weed, *The Copper Handbook: A Manual of the Copper Industry of the World*, Vol. 11 (Houghton, MI: Walter Harvey Weed, 1914) 703; "Certificate of Incorporation of the Delaware Valley Exploration Company," February 10, 1917, Warren County Corporations Book 5, Warren County Courthouse, Belvidere, New Jersey; George Eckhardt, Warren County Sheriff, to Dr. H. H. Wolford, November 11, 1918, Warren County Deed Book 215, p. 28-31, Warren County Courthouse, Belvidere, New Jersey.

payment, the Berendsens agreed to assume ownership by covering the cost of unpaid taxes and a wage claim against the land for $5,000.[48]

THE BOY SCOUT ERA 1925-1970

Henry A. Berendsen and his wife Hannah sold the mining property to the Trenton Council of the Boy Scouts of America on May 20, 1925. They, however, reserved from the conveyance all of the machinery on the premises including the boiler, gas producing plant, dynamos, crushers, mining machinery, barrel stave mill machinery, shafting, pulleys and hangers, and all of the tramway track, cars, and equipment. The Berendsens contracted with Max Tomback, a Newark junk dealer, to remove all of the machinery. By 1928, Tomback completed the task. So ended the long history of attempts to extract copper at Pahaquarry.[49]

The Trenton Council of the Boy Scouts developed Camp Pahaquarra on the site of the former mine property and adapted most of the structures for their purposes (see Boy Scout Era Historic Period Plan). The 1909-10 mill addition was remodeled soon after 1925 into a mess hall, called the Good Times Hall after the *Trenton Evening Times*, with the kitchen located in the old producer gas room (Historic Photo 27). The mining office building, named Hottell Hall after Joseph B. Hottell, the council president, first served as a store, camp office, library, and staff meeting room, while the upper floor served as staff sleeping quarters. Later it became housing for the camp ranger until 1951 when it was converted into an infirmary. In 1925, the Boy Scouts constructed a concrete dam across Mine Brook a little upstream from the old mill building to block the creek for a water supply. Another concrete dam was built farther upstream over the early twentieth century mine dam in the mid-1950s for the same purpose. The mine workers' boardinghouse, renamed the Wolf Cub House, first served as a staff dining hall with sleeping quarters on the upper floor (Historic Photo 28). Later it became a storage facility. In 1951 the lower floor was remodeled and a one-story addition was added to one side as quarters for the camp ranger (Historic Photo 29 and Illustrations 18A and 18B). The barn became a garage, while the blacksmith shop, named the Eppele Craftsmanship Shop for Frank J. Eppele, a friend of scouting, served as a workshop for camp repair work and an area for craftsmanship classes. Next to the blacksmith shop, the brick barrel stave plant became a first aid

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48. Certificate of Increase of Capital Stock of the Pahaquarry Copper Company, March 26, 1913, Pahaquarry Copper Company reports, B 538 7091-1812, New Jersey Department of State, Commercial Recording Division, Trenton, New Jersey; *The Engineering and Mining Journal* 96(October 25, 1913) 809; Walter Harvey Weed, *The Copper Handbook: A Manual of the Copper Industry of the World, 1912-13* (Houghton, Mich.: Walter Harvey Weed, 1914) 703; *Newark* (New Jersey) *Evening News*, July 5, 1924; Certificate of Incorporation of the Delaware Valley Exploration Company, February 10, 1917, Warren County Corporation Book 5, pp. 47-48; Irvin M. Beavers, et al. to the Delaware Valley Exploration Company, February 20, 1917, Warren County Deed Book 207, pp. 350-353; Writ of Fieri Facias by the Court of Chancery of the State of New Jersey, July 29, 1918, Warren County Deed Book 215, pp. 28-31; George Eckhardt, Warren County Sheriff, to Dr. H. H. Wolford, November 2, 1918, Warren County Deed Book 215, p. 28; Dr. H. H. Wolford to Harry H. Deshler, February 17, 1920, Warren County Deed Book 219, p. 204; Harry H. Deshler, et al. to Hannah Berendsen, February 4, 1922, Warren County Deed Book 224, pp. 590-593, Warren County Courthouse, Belvidere, New Jersey.

49. Henry A. Berendsen and wife Hannah to the Trenton Council of the Boy Scouts of America, May 20, 1925, Warren County Deed Book 237, pp. 166-168, Warren County Courthouse, Belvidere, New Jersey; Phyfe, "Copper Deposits of New Jersey," 157.

station. About 1943, a new mess hall was built partly on the site of the mining era blacksmith shop and the brick barrel stave manufacturing building. It incorporated those structures' foundations into the much larger mess hall foundation. Approximately 1943, much of the mill building was razed, and, by the mid-1950s, the remaining stone walls were covered with a wood-frame structure which served as a winter quarters for scouts (Historic Photo 30). At the same time, the barn and ice house were razed. The oil house was expanded in size in the mid-1950s for a Boy Scout trading post (Historic Photo 31). A severe flood in 1955 damaged the old mining company office (Boy Scout infirmary) with the result that the second floor was removed and a covered porch added to it (Historic Photos 32 and 33). In 1926 a ceremonial site, called the Durling Ceremonial Grounds, after William D. Durling, was developed on the level, silted area behind the lower 1750s dam. It was later adapted by the Boy Scout Order of the Arrow for ceremonies (Historic Photos 34 and 35). In 1925, the camping area was located along the Delaware River upstream from its confluence with Mine Brook. The Lawton Parade Grounds, named for Lewis Lawton, Jr., vice-president of the council, abutted this camp area. Tent platforms and latrines for camping were later built up the hill from this area. With the purchase of the Dimmick land on the opposite side of Mine Brook in approximately 1939, the Scouts developed this site for a parade field, baseball diamond, nature area, latrine, archery field, and a personal fitness site (Illustration 19). North of Mine Brook, the area along the Delaware River was designated Oakley Cove after C. H. Oakley, a former council president. Here, the scouts had access to swimming, boating, canoeing, and fishing. Staff housing, a latrine, craft shop, storage building, and dock later occupied this area. The Boy Scouts used the buildings on the Dimmick property for staff housing and storage. A chapel was completed in the 1950s uphill from the site of the mine buildings. In 1940, a tract of Pahaquarra land northeast of Mine Brook was sold to the Perth Amboy Boy Scouts who established Camp Cowaw on that site.[50]

In August 1942, an engineer from the United States Bureau of Mines surveyed the Pahaquarry site for potential copper to support the Second World War. He concluded that the mine offered little opportunity for development and recommended no further work be done there (see Appendix D). Two more inspections occurred during the war. H. R. Cornwall of the U. S. Geological Survey analyzed the ore in June 1943 and found the grade to be too low to develop (see Appendix E). Herbert P. Woodward of the New Jersey Department of Conservation and Development examined the mine in 1944 and concluded the ore was too lean and the transportation costs too high to warrant development (see Appendix F).[51]

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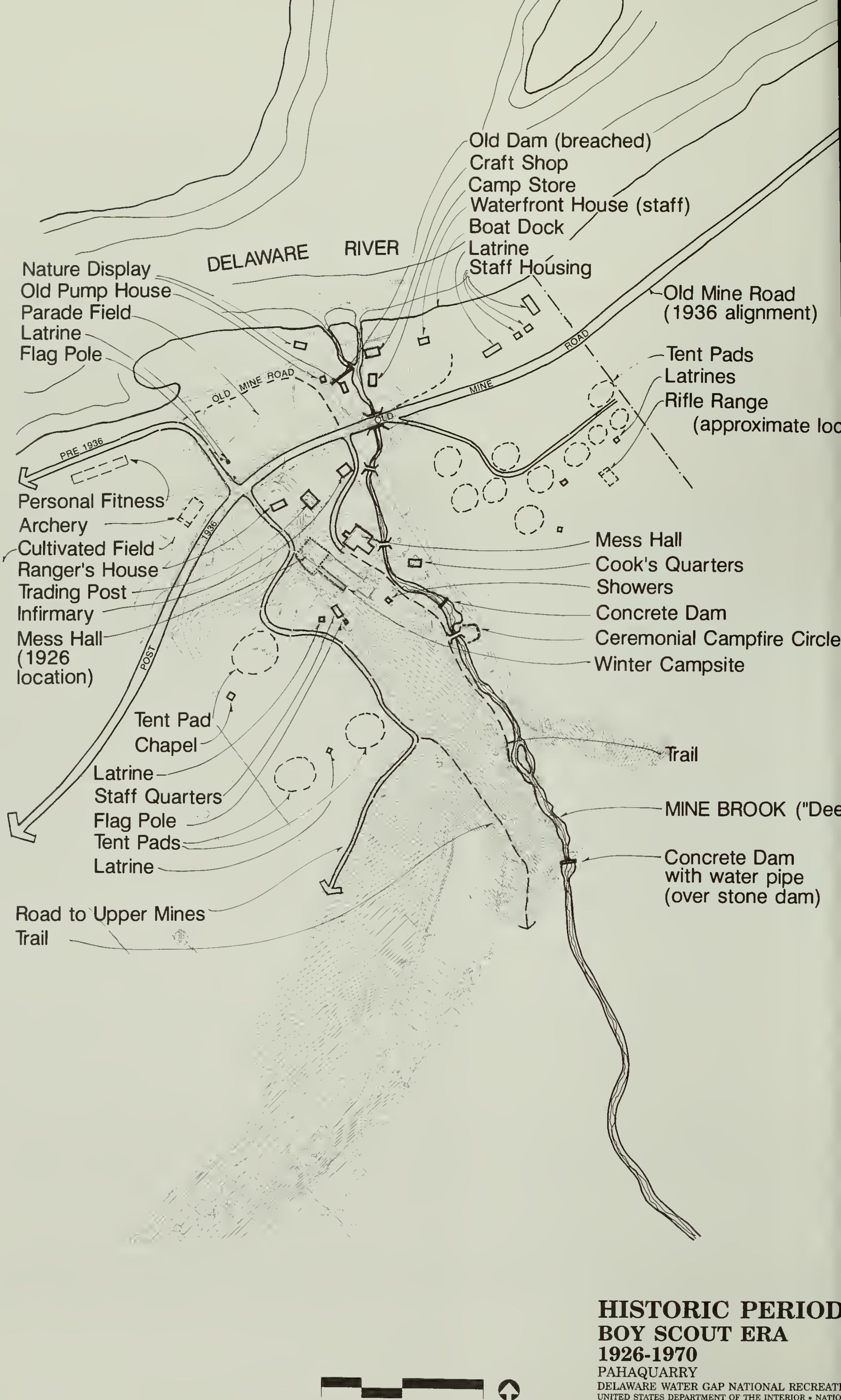
50. Interview of John Niper, Hackettstown, New Jersey by Berle Clemensen, April 17, 1993; Interview of Leonard Rue, Jr. by Berle Clemensen, April 20, 1993; Map of Camp Pahaquarra supplied by John Niper; William D. Durling, *The Old Mine Holes and the Old Mine Road* (Trenton, N.J.: Clifford H. Oakley, 1927) 21-28.

51. "The Pahaquarry Copper Mine, Warren County, New Jersey," Report of the United States Bureau of Mines to Hon. Harold L. Ickes, Secretary of the Interior, August 1942; H. R. Cornwall, "Pahaquarry Copper Mine, Pahaquarry, New Jersey" United States Geological Survey, June 1943; Herbert P. Woodward, "Pahaquarry Mine," Report to the New Jersey Department of Conservation and Development, 1944.



HISTORIC PERIOD
BOY SCOUT ERA
1926-1970

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREAT
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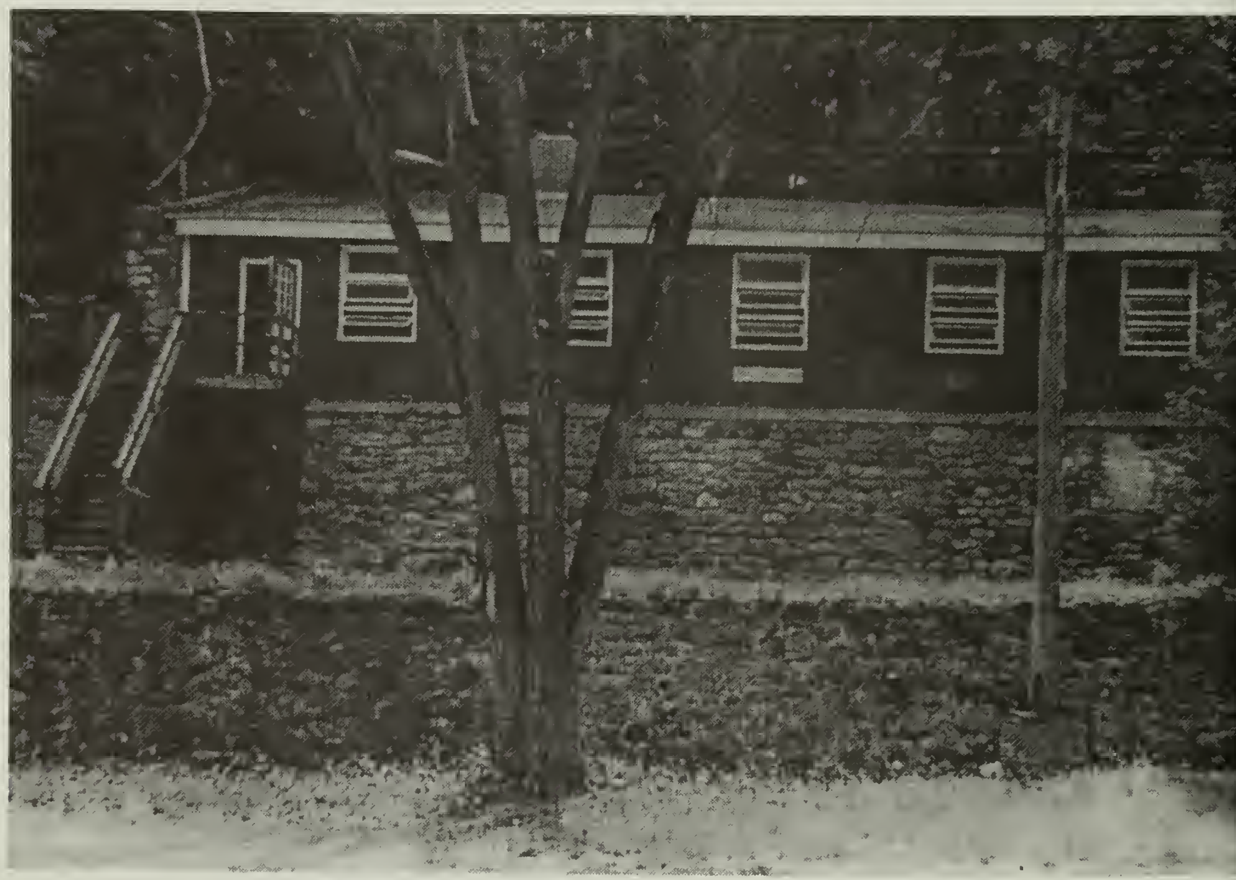
Historic Photo 27: A portion of the Pahaquarry Mill converted to the Boy Scout Mess Hall Ca. 1927
Courtesy of Don Pace, Easton, Pennsylvania

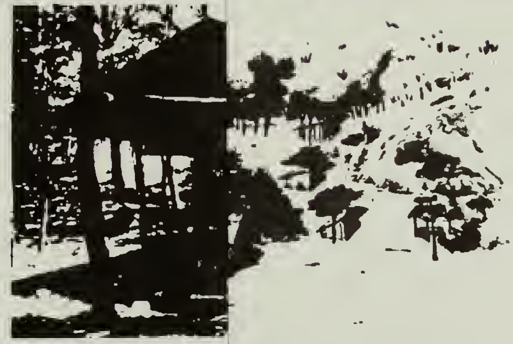
Historic Photo 28: The Old Miners' Boarding House converted to Boy Scout Staff Quarters and a Staff Mess Hall, 1928
Courtesy of Don Pace, Easton, Pennsylvania

Historic Photo 29: A 1965 photograph of the Old Miners' Boarding House Showing the 1951 side addition when it became the Chief Ranger's Dwelling
Courtesy of Don Pace, Easton, Pennsylvania



Historic Photo 30: Boy Scout Wood Frame Building Erected on Part of the Mill's Stone Foundation in the 1950s for Winter Quarters
Courtesy of Don Pace, Easton, Pennsylvania

Kitchen equipment ca
newly equipped kitche
camp kitchens in the
Foundation. Kitchen E



Cabins that were built embers of their own Troop. In rare instances where
The picture of one of t duals they are organized into provisional camp Troops
quate, provisions. uld, therefore, provide for average Troop-size accomo-
h Summer-Winter cabins as shown above are needed.

Following the National
had been constructed f enton Kiwanis Club and the Penelyte Division of the
These "temporary" tables and benches were provided in 1952.

These essential camp
and stone and masonry
dismantled some 10 yea

atment of these foundations which will combine under
dings needed. Stone work will be done with volunteer
windows plus equipment. The Winter cabin will house
ainy day pavilion area will provide Winter storage when
voy, and the trading post will add storage capacity if

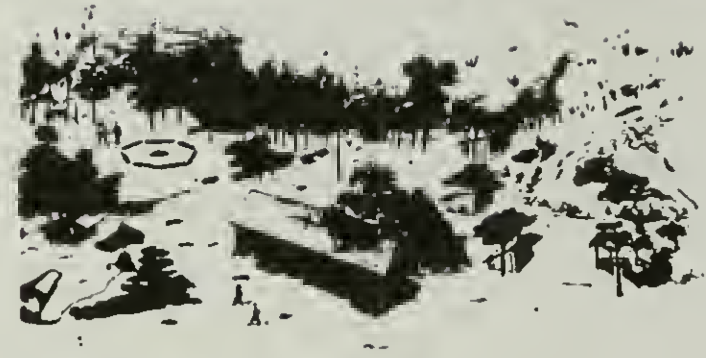
Camp Pahaquarry Facility Improvement Ca. 1955
Courtesy of John Niper, Hackettstown, New Jersey

Kitchen COMPLETED Equipment

Kitchen equipment came in for its share of criticism by Health officials in 1951. The newly equipped kitchen, views of which appear in the next column, is one of the best camp kitchens in the East. This advance in 1952 was made possible by the Kerney Foundation. Kitchen Equipment Completed 1952.

New Camp Sites

Cabins that were built many years ago are now in serious, almost dangerous condition. The picture of one of these cabins shown above indicates the need for new, more adequate, provisions.



Scouts camp at Pahaquarra as members of their own Troop. In rare instances where Scouts register for camp as individuals they are organized into provisional camp Troops for their stay. New facilities should, therefore, provide for average Troop-size accomodations. Six Troop sites, two with Summer-Winter cabins as shown above are needed.

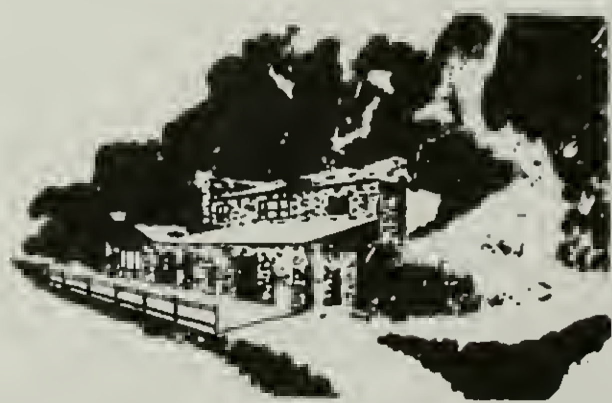
Dining Hall Tables COMPLETED and Benches

Following the National Jamboree at Washington, D.C. in 1938 thirty patrol tables which had been constructed for temporary use were purchased for the Pahaquarra Dining Hall. These "temporary" tables had served for 14 years but were no longer sanitary.

Through the generosity of the Trenton Kiwanis Club and the Panelyte Division of the St. Regis Paper Company new tables and benches were provided in 1952.

Winter Cabin; Equipment Storage; Rainy Day Area; and Trading Post

These essential camp facilities do not exist. There are however, suitable foundations and stone and masonry walls available at the site of one of the mine buildings which was dismantled some 10 years ago.



Pictured above is an original treatment of these foundations which will combine under two roofs the four functional buildings needed. Stone work will be done with volunteer labor. Cost will be roofing and windows plus equipment. The Winter cabin will house staff during Summer camp. The rainy day pavilion area will provide Winter storage when fitted with shutters in each archway, and the trading post will add storage capacity if needed.

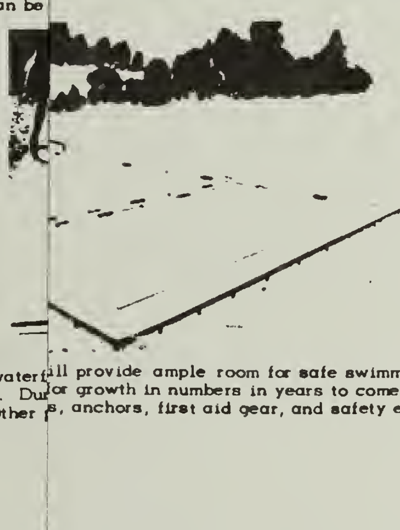
Illustration 18A: Camp Pahaquarry Facility Improvement Ca. 1955
Courtesy of John Niper, Hackettstown, New Jersey

These ~~~ rrow's Needs

A building which was uilding will provide a "dual purpose" facility of tool shed. With conversi p headquarters. Scouts and Leaders are now doing center, Scouts do not hav material for windows, floor, roof, and some skilled for Winter quarters to da and a Summer headquarter

Sanitary facilities such ie to erect modern dry pit type of sanitation through- cer could not certify the after State Park facilities and in most instances are adequate sanitary facilit is the double latrine shown above. PLETED BY KAUFFMAN ESTATE.

An investment the size uilding which provides Ranger's apartment on ground round Camp Ranger is n nd floor. Most camps need to provide separate build- ties include maintenance This proposal saves at least $10,000.00 by "using original purchase can be



Pictured above is waterf ill provide ample room for safe swimming for present 75 Scouts per swim. Du for growth in numbers in years to come. Also needed date the campers. Other s, anchors, first aid gear, and safety equipment.

mp Pahaquarra Facility Improvement Ca. 1955
urtesy of John Niper, Hackettstown, New Jersey

These Are Today's Conditions

These Are Tomorrow's Needs

Winter Cabin and Summer Headquarters

A building which was on the property at time of purchase is currently used as a tool shed. With conversion of two story building to Ranger's apartment and maintenance center, Scouts do not have Winter camping facilities as two-story building has been used for Winter quarters to date. This building can be remodeled to provide Winter quarters and a Summer headquarters.

Proposed remodeling of existing building will provide a "dual purpose" facility of Troop Winter cabin and Summer camp headquarters. Scouts and Leaders are now doing excavation and stone work. Needed is material for windows, floor, roof, and some skilled labor to erect same.

Sanitation

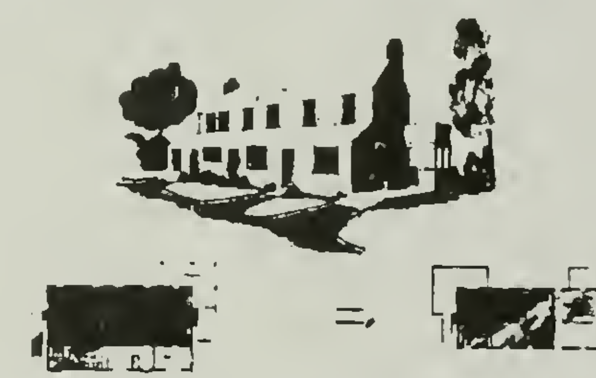
COMPLETED

Sanitary facilities such as the one pictured above were so poor that the State Health officer could not certify the camp in 1951. Immediate emergency steps were taken to provide adequate sanitary facilities.

The Kauffman Estate made it possible to erect modern dry pit type of sanitation throughout the camp. These are patterned after State Park facilities and in most instances are designed to serve two camp sites as is the double latrine shown above.
THIS PROJECT IS COMPLETED BY KAUFFMAN ESTATE.

Ranger's Quarters and Maintenance

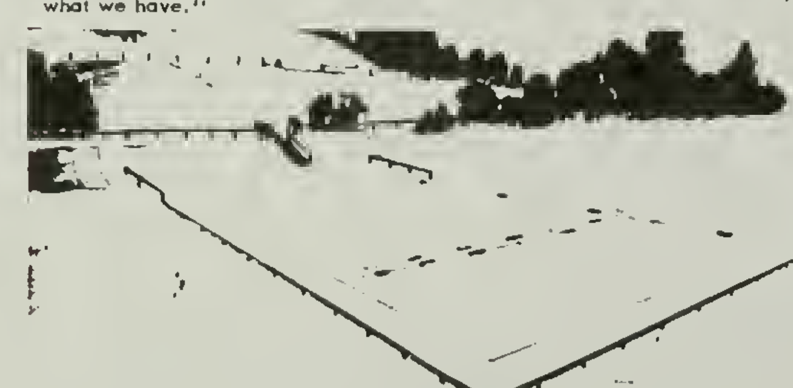
An investment the size of the Pahaquarra Scout Reservation needs protection. A year round Camp Ranger is now housed temporarily in the camp infirmary. His responsibilities include maintenance work. The building pictured above which was a part of the original purchase can be remodeled to provide an apartment and maintenance center.



Proposed remodeling of existing building which provides Ranger's apartment on ground floor and maintenance shop on second floor. Most camps need to provide separate buildings with resulting higher costs. This proposal saves at least $10,000.00 by "using what we have."

Waterfront

Pictured above is waterfront pier and float. Maximum safe capacity of this equipment is 75 Scouts per swim. During the 1952 season multiple swims were scheduled to accomodate the campers. Other program activities were curtailed to make this possible.



New waterfront as outlined above will provide ample room for safe swimming for present day camp enrollment with a margin for growth in numbers in years to come. Also needed are 15 row boats, 15 canoes, 3 punts, anchors, first aid gear, and safety equipment.

Illustration 18B: Camp Pahaquarra Facility Improvement Ca. 1955
Courtesy of John Niper, Hackettstown, New Jersey

Historic Photo 31: The Old Oil House Addition of the mid-1950s
At this time it was Converted to a Trading Post by the Boy Scouts. The Gable End of the Old Oil House is visible on the right along the ridge line of the addition. The Old Dormitory, later Chief Rangers Quarters can be seen in the upper center.
Courtesy of John Niper, Hackettstown, New Jersey

Historic Photo 32: A Ca. 1955 View of the Mine Office Building, later Boy Scout Infirmary, after its 1955 Modification
Courtesy of Leonard Rue, Jr., Blairstown, New Jersey

Historic Photo 33: A 1965 Photograph of the Mine Office Building, later Boy Scout Infirmary, after its 1955 Modification
Courtesy of Don Pace, Easton, Pennsylvania

Historic Photo 34: Boy Scout Order of the Arrow Ceremonial Site Located on the Silted Area behind the Lower 1750s Dam
Courtesy of Don Pace, Easton, Pennsylvania

Historic Photo 35: Entrance to the Boy Scout Order of the Arrow Ceremonial Site
Courtesy of Don Pace, Easton, Pennsylvania

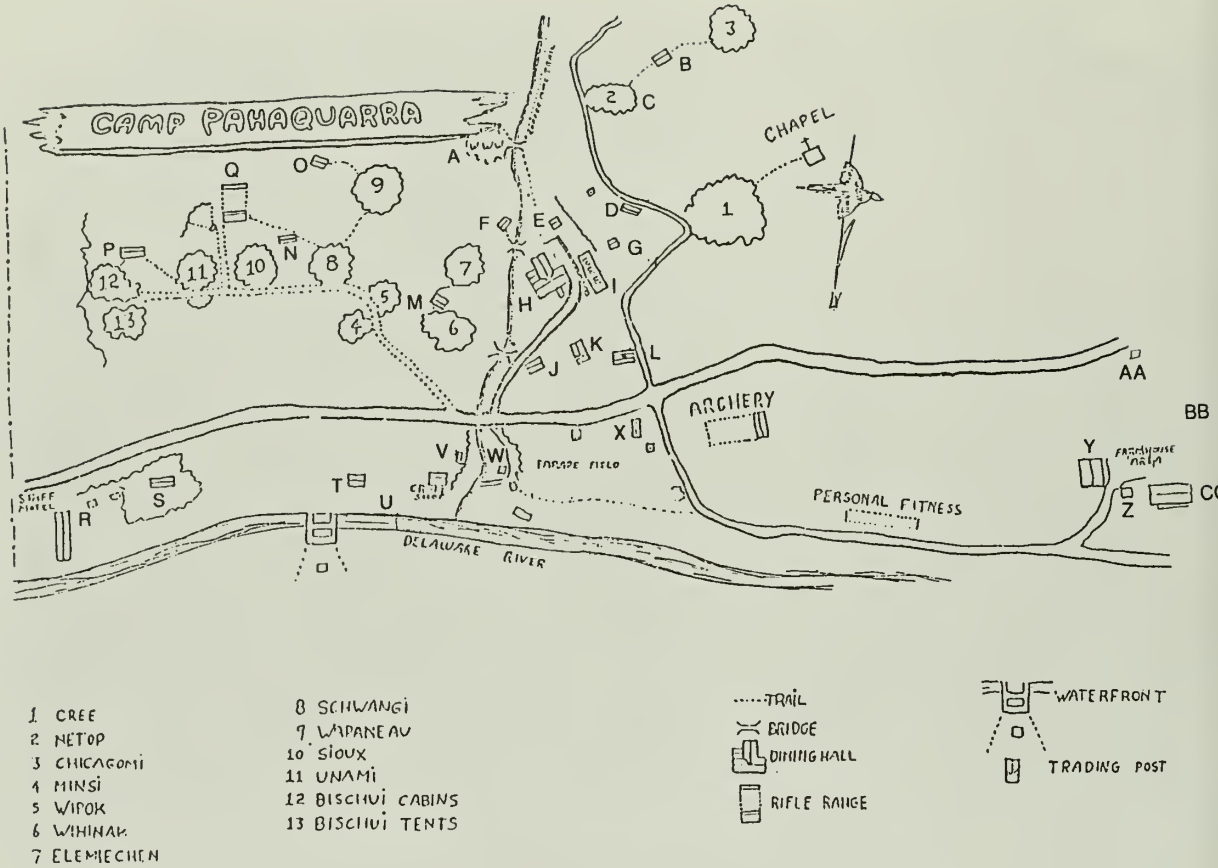


Illustration 19: Layout of Camp Pahaquarra Ca. 1960
Courtesy of John Niper, Hackettstown, New Jersey

A. Order of the Arrow Ceremonial Site
B. Latrine
C. Adirondack Shelters
D. Latrine
E. Showers
F. Mess Hall Cook's Quarters
G. Staff Quarters
H. Mess Hall
I. Winter Quarters
J. Infirmary
K. Trading Post
L. Chief Ranger's House
M. Latrine
N. Latrine
O. Latrine
P. Latrine
Q. Rifle Range
R. Staff Quarters
S. Latrine
T. Water Front House (Staff)
U. Bonfire Area
V. Camp Gear Storage
W. Nature Area Building
X. Latrine
Y. Storage (Dimmick Barn)
Z. Garage (Dimmick)
AA. Storage
BB. Orchard (Dimmick)
CC. Staff Quarters (Dimmick)

Areas numbered 1-13 are the location of tent platforms or cabins. Each area had a name as indicated on the layout map.

Since hope springs eternal, a copper shortage in 1950 prompted Daniel Earle, an executive of the Boy Scouts of America, to contact the U. S. Bureau of Mines in October of that year with a request that the mine be surveyed. He felt that, since a good road had recently been built near the property, transportation costs might make the mine profitable. Nothing came of this effort to operate the Pahaquarry mine. Finally, in 1961, a mining company briefly examined Pahaquarry and concluded that the copper was too low-grade to make mining profitable.[52]

PUBLIC ACQUISITION OF THE PAHAQUARRY SITE

In June 1970, the United States Army Corps of Engineers purchased the Camp Pahaquarra land from the Boy Scouts of America. Soon thereafter, the Corps of Engineers removed most of the Boy Scout structures and the remaining mining era buildings in preparation for the Tocks Island Dam construction. The site, however, still contains remains from four mining periods such as adits, shafts, prospect holes, tailings piles, remnants of three rock dams, tramway corridor, and a quarry, as well as foundations and some walls from mining-related buildings. Roadways and trails to the buildings and mines, and historic landscape patterns and relationships can still be traced. As a result, sufficient above-ground character-defining features remain from the various mining period landscapes to present a picture and understanding of the Pahaquarry mining operations.

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52. Daniel W. Earle, Scout Executive, to J. H. Hedges, United States Bureau of Mines, October 16, 1950.

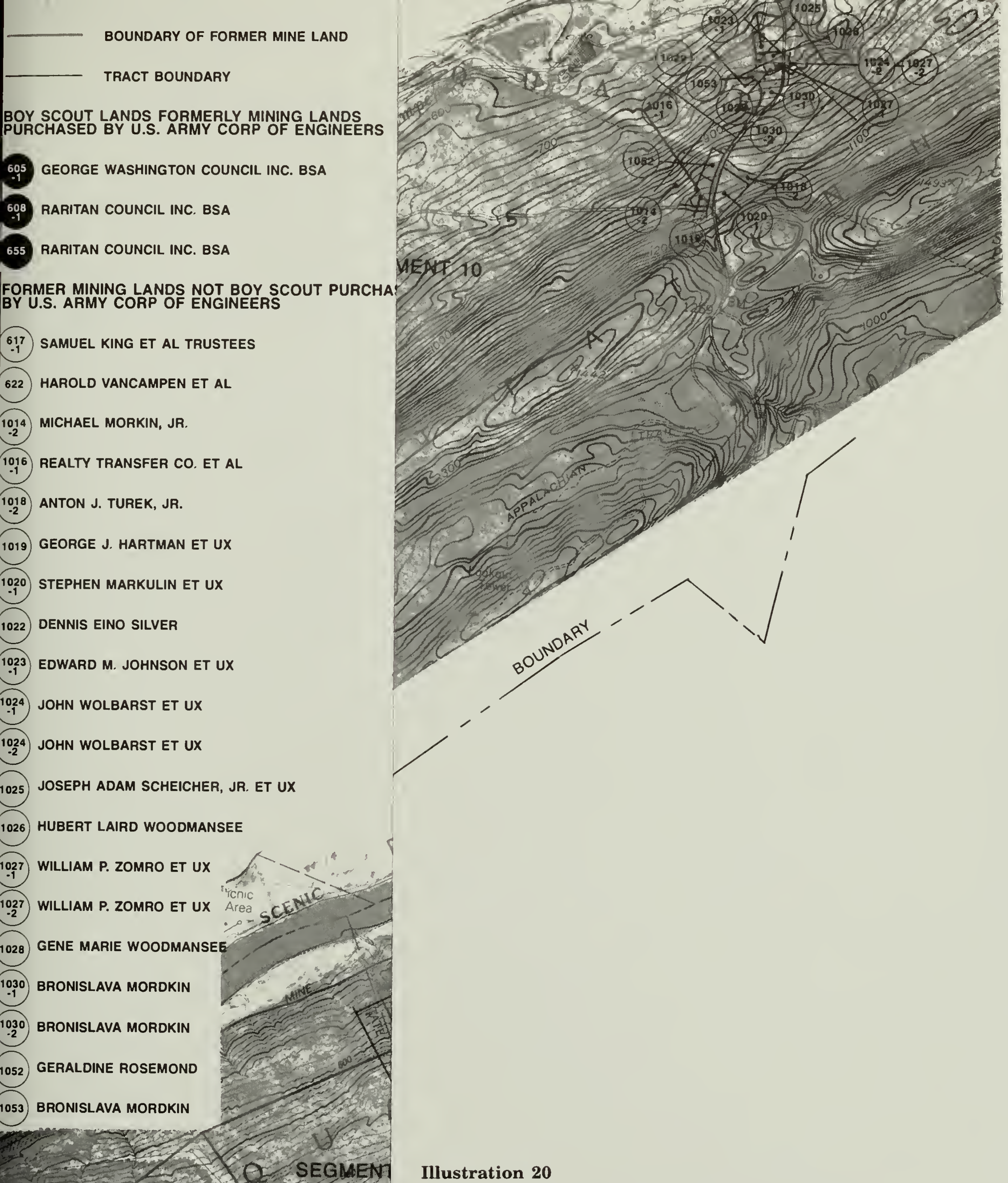

Illustration 20

1970 LAND TRACT

PORTION OF FORMER MINE LANDS PURCHASED BY THE FEDERAL GOVERNMENT

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

DSC • 620 • 25030 • JAN 94

Illustration 20

1970 LAND TRACT

PORTION OF FORMER MINE LANDS PURCHASED BY THE FEDERAL GOVERNMENT

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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PART III: DOCUMENTATION OF EXISTING CONDITIONS

INTRODUCTION

The Pahaquarry Mine site no longer exists as a mining operation or a Boy Scout camp. Both of those uses ended in 1912 and 1970 respectively. As documented in part 2 of this report, many of the features of those activities have been removed.

Most of what remains as evidence of the historic activity at Pahaquarry exists as ruins, remnants, or archeological sites. Also evident are the natural characteristics and the influences and relationships these had on the historic use and development of the site. Unless viewed as a whole with an understanding of the history of use on the site, little appears to exist from the busy activity that the site once experienced. In fact, a visitor could easily walk through the site and notice only the most obvious features such as the shafts and mill ruins.

When taken as a whole, however, the landscape of Pahaquarry reveals a great deal more of the story of how this landscape was used over three centuries in attempts to mine copper and as a Boy Scout camp. It is with such a "wide angle view" of the whole landscape that the extent and nature of the resource is understood. As National Register Bulletin 42, "Guidelines for Identifying, Evaluating, and Nominating Historic Mining Properties," states, in reference to the features of an historic mining property:

> Although these individual components may appear to lack distinction, the combined impact of these separate components may enable the property to convey the collective image of a historically significant mining operation. In essence, the whole of this property will be greater than the sum of its parts.

This section documents those character-defining features that comprise the "whole" and that when looked at collectively comprise the historic landscape. The character-defining features which make up the historic landscape are based on those identified in "National Register Bulletin 30 Guidelines for Evaluating and Documenting Rural Historic Landscapes."

PATTERNS OF SPATIAL ORGANIZATION AND LAND USE

Spatial organization of a landscape usually reflects some logical relationships between use and the natural characteristics of the landscape. This organization is typically most prominent in a landscape when laid out or designed to some rational plan or aesthetic taste as in a designed landscape such as a park or garden. In a working or vernacular landscape, use and function often dictates the spatial relationships or organization which develop. This was the case at the Pahaquarry mine site. Spatial organization was a result of the functional relationships between different land uses and activities and the natural characteristics of the property.

The overall spatial organization, determined by land uses, and influenced by the natural characteristics of the landscape is still evident today at the Pahaquarry site. Figures 1A, 1B, 1C help to illustrate these relationships. The following discussion of existing conditions and extant evidence of former land use and patterns of spatial organization is arranged by period of use. Neither the 1829 period of exploration at Pahaquarry, nor the 1867 timbering period are included, however, because they are thought, as explained earlier, to have been relatively inconsequential to the development of the property. The specific remains of the historic periods of the property are addressed in detail under the existing conditions section; buildings and structures, and circulation, and related Figures 5A, 5B, 5C, 6A, 6B, 6C, and 6D.

MINING PERIODS

1750s Mining

As shown in Figure 1A, exploration for copper concentrated along the presumed ore bearing rock on both sides of Mine Brook. This brook provided power for a mill that was located on a level site near the bottom of the brook. Circulation connected working areas to the mill site, residence, and a docking area for shipping by river.

Properties were purchased to reflect presumed ore-bearing rock and necessary river access. The two acre lot accessing the river and providing developable land is approximately centered on the land owned and presumed to be mineral bearing by the colonial miners. Except for the mining activity during this period and nearby farming that was beginning to develop, the land was in a natural state.

Although specific buildings no longer exist from this period, the entire spatial organization and relationship of use and the natural characteristics of the landscape is still very evident.

1847-1862 Period

As shown in Figure 1B, mining explorations during this period generally followed the earlier colonial efforts except that they were higher up on mineralized rock with some reworking of one lower adit. Support housing, buildings, and transportation had moved closer to the workings on newly acquired land fronting the river and/or company officer lands. Land ownership between company officials and the company, as well as land use, reflects a more speculative nature of mining at this time. By 1862, after reorganization, the company owned all of the associated mining land. Ownership associated with mining was considerably expanded from the colonial period.

Roads were expanded and improved during this time. Old Mine road was relocated lower along the river after 1830 (Illustration 19). Farming of the lower terraces began as the population of the area increased. Only a small area of suitable farming land on the lower river terrace was owned by the company or company officials and this was used for support activities for the mining operations. The upper steeper river terrace was cleared but later abandoned for agricultural use. In 1867, the Allegheny Mining Company sold the land to Aaron Keyser who used it for timber production.

Much like the earlier colonial period, although specific buildings associated with this period of exploration no longer exist, the overall patterns of organization and land use are still evident. Roads, the evidence of mining exploration sites, the sites of support activities, and their relationships to the natural characteristics of the landscape still are visible today. The evidence of farming and pasture lands are also evident although these are disappearing as former farmland is allowed to go fallow.

1901-1913 Period

Land use continued to follow the general patterns of the earlier mining explorations as shown in Figure 1C. Some test explorations continued along the lower outcrops of mineralized rock and some reworking occurred in one early lower adit. The majority of effort, however, was concentrated on the high outcrop of rock using open pit mining. Support areas generally follow earlier patterns located on lower level areas adjacent to Mine Brook as well as an expanded area to transport the ore to the mill. The larger area, committed for support facilities for the mining, reflects the determined attempt of the period to mine the ore as well as changes in mining technology. Extensive adaptation and use of the natural characteristics of the site are also reflected in the large areas associated with support activities. Earlier roads continued to serve the uses of this period.

Properties were also the same as those of the previous period. These included the entire ridge along the Kittatinny Mountain believed to be ore bearing. The steep and marginal upper river terrace lands by this period had been abandoned for agricultural uses. The lower flat terraces and better agricultural land continued to be farmed.

The landscape spatial organization and land use of this period, like the earlier two periods of copper exploration, is still evident today in spite of some missing historic buildings and structures. The remaining features in the landscape, as well as their relationships to the

natural characteristics of the site, make this overall organization and land use understandable.

Timber Cutting and Boy Scout Period 1920-1970

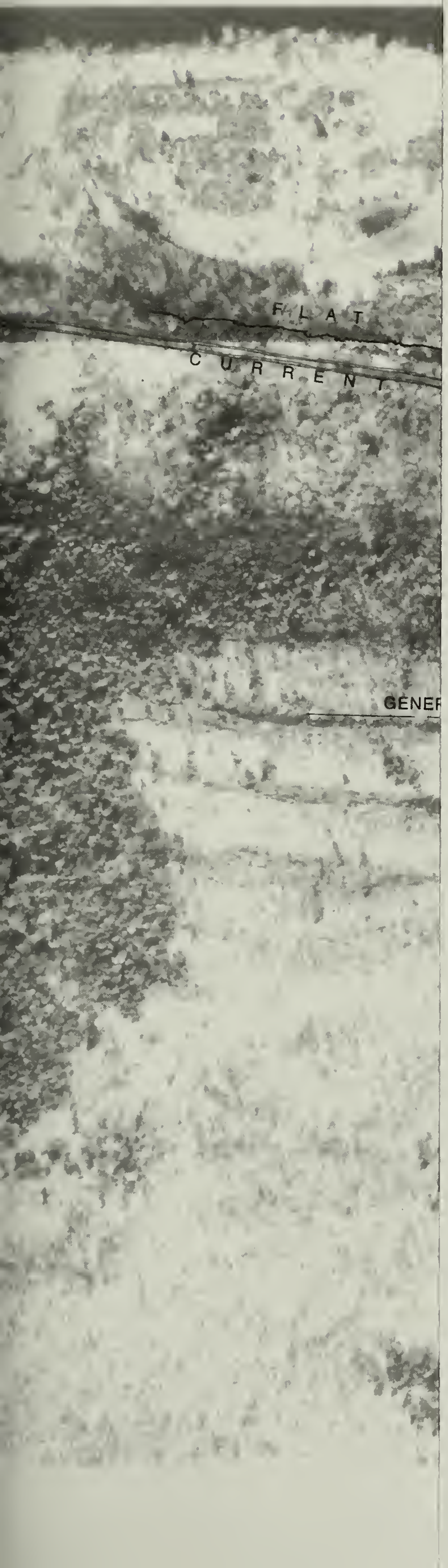
After the last mining period at Pahaquarry, there was a short period of timber cutting concentrated at the upper terrace above and to the northeast of Mine Brook. This was a small operation for only a few years. Part of the mill was converted to a saw mill establishing a pattern of adaptation of existing facilities and layout which would be followed by the Boy Scouts.

As illustrated in Figure 1D the Boy Scouts eventually either reused or located their support or central camp functions in the same areas as the mining periods. These were expanded, however, to include some of the former farm lands along the lower river terrace. The Shoemaker (Dimmick) property was eventually acquired by the Boy Scouts and part of the property adapted for support facilities. The lower flat river terraces that were converted from farmland to support or central camp functions continued to be maintained as open land.

Most of the overnight camp facilities were located on the previously cleared upper river terraces not far from the central support facilities. The remaining, mostly wooded part of the property, contained hiking trails many of which formerly served for mining period access routes. In 1936 Old Mine Road was again relocated in the vicinity of Mine Brook and the lower, post 1830, alignment fell into disuse.

Federal Acquisition to Present Period

After federal acquisition of the land, active use and development of the property came to an end. The buildings associated with the earlier uses of the property were removed. The NPS has managed the former mining site primarily as trail head access and for limited interpretation of the mining history of the property. Vegetation of the former cleared support areas and farm lands has changed from these open uses as the forest has begun to reclaim these areas. Some of the original roads have continued to be used while others are also being reclaimed by forest.



LAND USE

EXTANT EVIDENCE INDICATING MINING EXPLORATION AREA

EXTANT EVIDENCE TO INDICATE MINING EXPLORATION SUPPORT AREA: HOUSING, BARNS, BUILDINGS AND STRUCTURES

NON EXTANT LOCATION OF MINING SUPPORT AREA

ROADS

PROPERTY LOT LINES

LIMIT OF MINING LAND

SPATIAL ORGANIZATION

1. RIVER ACCESS FOR SHIPPING ORE AT IDEAL LOCATION CENTRAL TO PROPERTY PROVIDED EASE OF RIVER ACCESS AND FLAT BUILDABLE LAND
2. MINEBROOK PROVIDED POWER FOR MILL
3. PROBABLE ACCESS ROAD TO UPPER MINE WORKING AREA
4. PROBABLE ACCESS TO LOWER MINE TUNNEL
5. MIING EXPLORATIONS FOLLOWING GEOLOGIC OUTCROP ABOVE GROUND
6. POSSIBLE MILL LOCATION AT LEVEL OPENING OF MINEBROOK

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

A DRY LAID STONE DAMS

B REMNANT MILL RACE

C TUNNELS, SHAFTS, AND SPOIL PILES

D TEST HOLES IN STEEP RAVINE

E SPECULATED EXCAVATION SITE ON ROCK OUTCROP

NOTES:
- IT IS UNCLEAR HOW THE ROAD SYSTEM CONNECTED THE MNING AREAS TO THE MILL AND TO THE 2 ACRE BUILDING LOT AND RIVER ACCESS
- THE 200 ACRE LOT HAS NOT BEEN FIELD INVESTIGATED FOR EVIDENCE OF MINING
- THE LOCATION OF THE MILL IS SPECULATED BASED ON EXISTING TERRAIN, MILL DAM LOCATIONS, AND MINEBROOK
- IT IS POSSIBLE THAT SOME REWORKING OR TEST HOLES ATTRIBUTED TO THIS PERIOD ARE FROM THE 1829 PERIOD. HOWEVER, ANY WORK ATTRIBUTABLE TO THE 1829 PERIOD WOULD HAVE BEEN MINIMAL AS EXPLAINED IN THE TEXT.

Figure 1A

EXISTING CONDITIONS
LAND USE AND PATTERNS OF SPATIAL ORGANIZATION
1750S MINING PERIOD

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

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LAND USE

- EXTANT EVIDENCE INDICATING MINING EXPLORATION AREA
- EXTANT EVIDENCE TO INDICATE MINING EXPLORATION SUPPORT AREA: HOUSING, BARNS, BUILDINGS AND STRUCTURES
- NDN EXTANT LOCATION OF MINING SUPPORT AREA
- RDADS
- PROPERTY LOT LINES
- LIMIT OF MINING LAND

SPATIAL ORGANIZATION

1. RIVER ACCESS FOR SHIPPING ORE AT IDEAL LOCATION CENTRAL TD PROPERTY PROVIDED EASE OF RIVER ACCESS AND FLAT BUILDABLE LAND
2. MINEBROOK PRDVIDED POWER FOR MILL
3. PROBABLE ACCESS ROAD TO UPPER MINE WORKING AREA
4. PROBABLE ACCESS TO LOWER MINE TUNNEL
5. MIING EXPLORATIONS FOLLOWING GEOLOGIC DUTCROP ABOVE GROUND
6. POSSIBLE MILL LOCATION AT LEVEL OPENING OF MINEBROOK

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

A DRY LAID STONE DAMS
B REMNANT MILL RACE
C TUNNELS, SHAFTS, AND SPOIL PILES
D TEST HOLES IN STEEP RAVINE
E SPECULATED EXCAVATION SITE ON ROCK OUTCROP

NOTES:
- IT IS UNCLEAR HOW THE ROAD SYSTEM CONNECTED THE MNING AREAS TO THE MILL AND TO THE 2 ACRE BUILDING LOT AND RIVER ACCESS
- THE 200 ACRE LOT HAS NOT BEEN FIELD INVESTIGATED FOR EVIDENCE OF MINING
- THE LOCATION OF THE MILL IS SPECULATED BASED ON EXISTING TERRAIN, MILL DAM LOCATIONS, AND MINEBROOK
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Figure 1A

EXISTING CONDITIONS

LAND USE AND PATTERNS OF SPATIAL ORGANIZATION 1750S MINING PERIOD

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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LAND USE

- EXTANT EVIDENCE OF MINING EXPLORATION AREA
- EXTANT EVIDENCE OF MINING EXPLORATION SUPPORT AREA: HOUSING, BARNS, BUILDINGS AND STRUCTURES
- NON EXTANT LOCATION OF MINING SUPPORT AREA
- CLEARED LANDS
- CLEARED PASTURE LAND ABANDONED BY 1880S
- ROADS
- PROPERTY LOT LINES
- LIMIT OF MINING COMPANY LAND BY 1867
- LAND OWNED BY COMPANY OFFICERS BEFORE 186'

T TIMBERED AREA LOGGED AFTER MINING PERIOD BETWEEN 1867-1880 BY OWNER KYESER

SPATIAL ORGANIZATION

1 FLAT RIVER FLOOD PLAIN PROVIDED IDEAL FARMING LAND

2 STEEP UPPER TERRACE MARGINAL FARMING LAND CLEARED FOR PASTURE

3 FLAT TERRACE ADJACENT TO MINEBROOK AND MINING AREA PROVIDED SUITABLE LAND FOR RIVER TRANSPORTATION ACCESS AND BUILDINGS

4 MINEBROOK PROMOTED AS IDEAL FOR POWERING A MILL

5 NEW ROADS CONNECTED MINING SITES TO BUILDING SITES AND RIVER ACCESS AND PROMOTED FOR ECONOMIC EASE OF TRANSPORTING ORE

6 OLD MINE ROAD ALONG RIVER TERRACE PROVIDED MAJOR TRANSPORTATION LINK

7 MINING EXPLORATION AREAS FOLLOWING GEOLOGIC OUTCROP ABOVE EARLIER WORKINGS

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

A EXPLORATORY SHAFTS, TRENCHES AND SPOILS

B SHAFT WHERE WINDLASS FRAME CONSTRUCTED

C LOWER TUNNEL REWORKED

D MINE ACCESS ROAD

E MINE ROAD

F RAMP TO RIVER ARCHEOLOGIC REMAINS, DRYLAND ROCK WALL

G ROCK WALLS AND ROAD

H LEVEL FALLOW FIELDS

I ROCK FIELD WALLS

Figure 1B

EXISTING CONDITIONS

LAND USE AND PATTERNS OF SPATIAL ORGANIZATION 1847-1862 MINING PERIOD

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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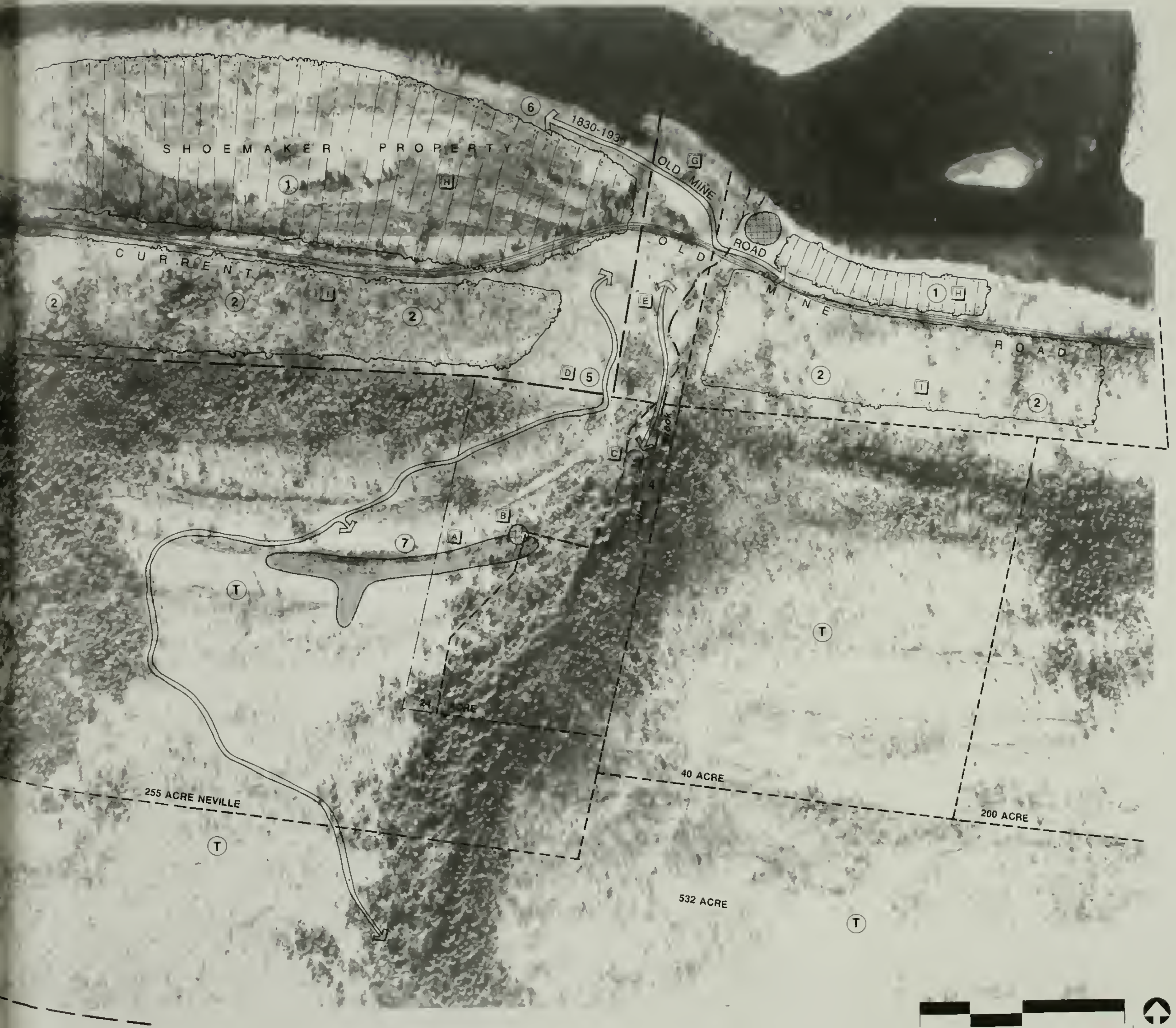

LAND USE

- EXTANT EVIDENCE OF MINING EXPLORATION AREA
- EXTANT EVIDENCE OF MINING EXPLORATION SUPPORT AREA: HOUSING, BARNS, BUILDINGS AND STRUCTURES
- NON EXTANT LOCATION OF MINING SUPPORT AREA
- CLEARED LANDS
- CLEARED PASTURE LAND ABANDONED BY 1860S
- ROADS
- PROPERTY LOT LINES
- LIMIT OF MINING COMPANY LAND BY 1867
- LAND OWNED BY COMPANY OFFICERS BEFORE 186
- T TIMBERED AREA LOGGED AFTER MINING PERIOD BETWEEN 1867-1880 BY OWNER KYESER

SPATIAL ORGANIZATION

1. FLAT RIVER FLOOD PLAIN PROVIDED IDEAL FARMING LAND
2. STEEP UPPER TERRACE MARGINAL FARMING LAND CLEARED FOR PASTURE
3. FLAT TERRACE ADJACENT TO MINEBROOK AND MINING AREA PROVIDED SUITABLE LAND FOR RIVER TRANSPORTATION ACCESS AND BUILDINGS
4. MINEBROOK PROMOTED AS IDEAL FOR POWERING A MILL
5. NEW ROADS CONNECTED MINING SITES TO BUILDING SITES AND RIVER ACCESS AND PROMOTED FOR ECONOMIC EASE OF TRANSPORTING ORE
6. OLD MINE ROAD ALONG RIVER TERRACE PROVIDED MAJOR TRANSPORTATION LINK
7. MINING EXPLORATION AREAS FOLLOWING GEOLOGIC OUTCROP ABOVE EARLIER WORKINGS

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

- A EXPLORATORY SHAFTS, TRENCHES AND SPOILS
- B SHAFT WHERE WINDLASS FRAME CONSTRUCTED
- C LOWER TUNNEL REWORKED
- D MINE ACCESS ROAD
- E MINE ROAD
- F RAMP TO RIVER ARCHEOLOGIC REMAINS, DRYLAND ROCK WALL
- G ROCK WALLS AND ROAD
- H LEVEL FALLOW FIELDS
- I ROCK FIELD WALLS

Figure 1B

EXISTING CONDITIONS
LAND USE AND PATTERNS OF SPATIAL ORGANIZATION
1847-1862 MINING PERIOD

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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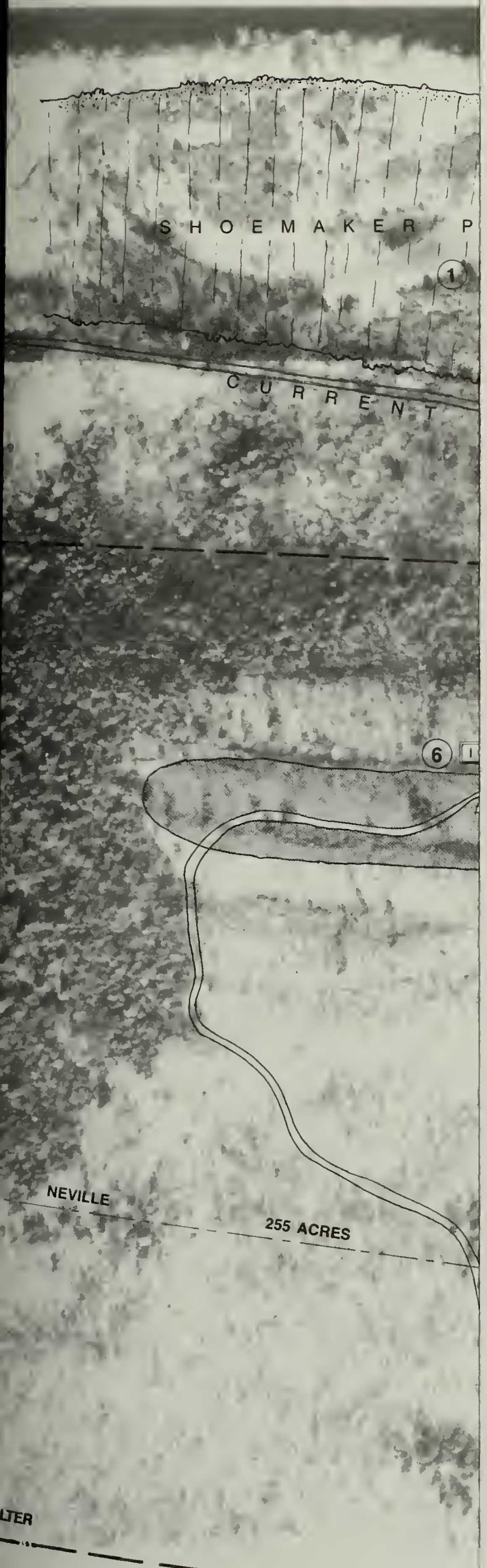

LAND USE

EXTANT FEATURES INDICATING MINING EXPLORATION AREA

EXTANT FEATURES INDICATING MINING EXPLORATION SUPPORT AREA: HOUSING, BARNS, BUILDINGS AND STRUCTURES

NON EXTANT LOCATION OF MINING SUPPORT AREA

CLEARED FARMING LANDS

ROADS

PROPERTY LOT LINES

LIMIT OF PROPERTY OWNERSHIP

T TIMBERED AREA LOGGED 1920-22 BETWEEN MINING AND BOY SCOUT OWNERSHIP

SPATIAL ORGANIZATION

1 FLAT RIVER FLOODPLAIN PROVIDED IDEAL FARMING LAND FOR ADJACENT FARMS

2 MINEBROOK PROVIDED WATER FOR MILL COMPLEX AND PROCESSING

3 MILL COMPLEX CONSTRUCTED ON LEVEL LAND ALONG MINEBROOK AND RIVER TERRACE

4 STEEP SLOPE ABOVE LEVEL AREA AND MINEBROOK PROVIDED IDEAL SITE FOR GRAVITY FLOW MILL

5 TOPOGRAPHY PROVIDED OPPORTUNITY FOR GRAVITY POWERED TRAM SYSTEM

6 OUTCROP WHERE ORE WAS MINED IN OPEN QUARRY

7 EARLIER ROADS PROVIDED ACCESS BETWEEN QUARRY AND MILL COMPLEX

8 RIVER PROVIDED WATER AND TRANSPORTATION

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

A OLD MINE ROAD AND ROCK WALLS

B COURTWRIGHT HOUSE SITE RUINS

C COMPLEX OF MILL AND MINING SUPPORT

D DAMS AND WATER LINES

E RUINS OF NEW TUNNEL, SPOIL PILES, WALLS

F EXPLORATORY TUNNEL

G TRAM FOUNDATIONS, TRACK TRACE, AND ROCK CUT

H QUARRY SITE ACCESS ROAD

I QUARRY SITE AND SPOIL PILES

J EXTENDED TUNNEL

Figure 1C

EXISTING CONDITIONS

LAND USE AND PATTERNS OF SPATIAL ORGANIZATION 1901-1912 MINING PERIOD

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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LAND USE

- EXTANT FEATURES INDICATING MINING EXPLORATION AREA
- EXTANT FEATURES INDICATING MINING EXPLORATION SUPPORT AREA: HOUSING, BARNS, BUILDINGS AND STRUCTURES
- NON EXTANT LOCATION OF MINING SUPPORT AREA
- CLEARED FARMING LANDS
- ROADS
- PROPERTY LOT LINES
- LIMIT OF PROPERTY OWNERSHIP
- T TIMBERED AREA LOGGED 1920-22 BETWEEN MINING AND BOY SCOUT OWNERSHIP

SPATIAL ORGANIZATION

1. FLAT RIVER FLOODPLAIN PROVIDED IDEAL FARMING LAND FOR ADJACENT FARMS
2. MINEBROOK PROVIDED WATER FOR MILL COMPLEX AND PROCESSING
3. MILL COMPLEX CONSTRUCTED ON LEVEL LAND ALONG MINEBROOK AND RIVER TERRACE
4. STEEP SLOPE ABOVE LEVEL AREA AND MINEBROOK PROVIDED IDEAL SITE FOR GRAVITY FLOW MILL
5. TOPOGRAPHY PROVIDED OPPORTUNITY FOR GRAVITY POWERED TRAM SYSTEM
6. OUTCROP WHERE ORE WAS MINED IN OPEN QUARRY
7. EARLIER ROADS PROVIDED ACCESS BETWEEN QUARRY AND MILL COMPLEX
8. RIVER PROVIDED WATER AND TRANSPORTATION

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

- A OLD MINE ROAD AND ROCK WALLS
- B COURTWRIGHT HOUSE SITE RUINS
- C COMPLEX OF MILL AND MINING SUPPORT
- D DAMS AND WATER LINES
- E RUINS OF NEW TUNNEL, SPOIL PILES, WALLS
- F EXPLORATORY TUNNEL
- G TRAM FOUNDATIONS, TRACK TRACE, AND ROCK CUT
- H QUARRY SITE ACCESS ROAD
- I QUARRY SITE AND SPOIL PILES
- J EXTENDED TUNNEL

Figure 1C

EXISTING CONDITIONS
LAND USE AND PATTERNS OF SPATIAL ORGANIZATION 1901-1912 MINING PERIOD

PAHAQUARRY
DELAWARE WATER GAP NATIONAL RECREATION AREA
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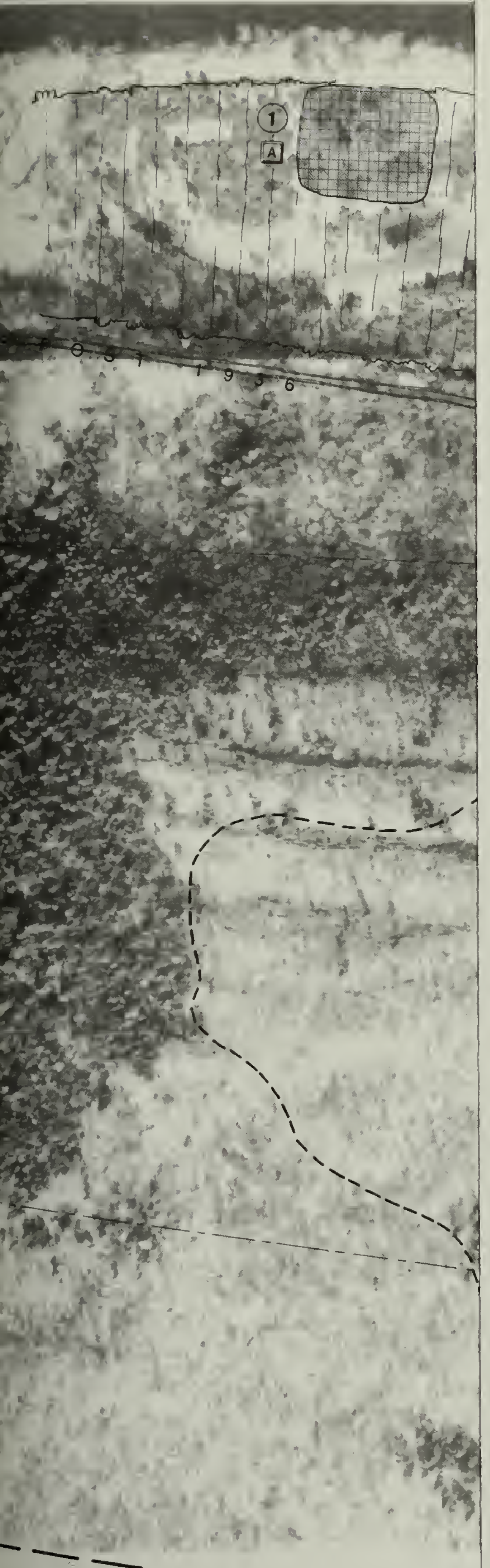

LAND USE

EXTANT EVIDENCE OF OVERNIGHT CAMP LOCATIONS

EXTANT EVIDENCE OF CENTRAL CAMP SUPPORT FACILITIES: HOUSING, STORE, INFIRMARY, SHOPS, PARKING, RECREATION SITES, ETC.

CLEARED FARMING AND PASTURE LANDS

ROADS

BOY SCOUT PROPERTY BOUNDARY

PROPERTY LOT LINES

MAJOR TRAILS

SPATIAL ORGANIZATION

1 DIMICKS FERRY SITE ADAPTED FOR STAFF HOUSING & STORAGE

2 LEVEL FARMLAND ADAPTED FOR PERSONAL FITNESS AND ARCHERY AREA

3 LEVEL PASTURE ADAPTED FOR BASEBALL AND PARADE FIELD

4 MINEBROOK PROVIDED WATER SUPPLY
MINING DAM RECONSTRUCTED

5 SLOPED TERRACE PROVIDE IDEAL CAMP SITES

6 LEVEL RIVER TERRACE, FARMLAND, AND MINING COMPLEX ADAPTED FOR CAMP BUILDING AND DEVELOPMENT

7 FORMER MINING ROADS ADAPTED FOR TRAILS INTO FOREST

8 RIVER PROVIDED RECREATIONAL OPPORTUNITIES

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

A VEGETATION, ROADS, TOPOGRAPHY

B ADAPTED MINE BUILDING STRUCTURE RUINS
BOY SCOUT BUILDING STRUCTURE RUINS

C CAMP SITE ROADS AND BUILDING RUINS

D DAM REMAINS

E VEGETATION, TOPOGRAPHY, AND STRUCTURE RUIINS

NOTE: ALL OF THE BOY SCOUT BUILT OR ADAPTED BUILDINGS AND STRUCTURES WERE DEMOLISHED AND EXIST AS RUINS

Figure 1D

EXISTING CONDITIONS
LAND USE AND PATTERNS OF SPATIAL ORGANIZATION 1925-1970 BOY SCOUT CAMP PERIOD

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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LAND USE

- EXTANT EVIDENCE OF OVERNIGHT CAMP LOCATIONS
- EXTANT EVIDENCE OF CENTRAL CAMP SUPPORT FACILITIES: HOUSING, STORE, INFIRMARY, SHOPS, PARKING, RECREATION SITES, ETC.
- CLEARED FARMING AND PASTURE LANDS
- ROADS
- BOY SCOUT PROPERTY BOUNDARY
- PROPERTY LOT LINES
- MAJOR TRAILS

SPATIAL ORGANIZATION

1. DIMICKS FERRY SITE ADAPTED FOR STAFF HOUSING & STORAGE
2. LEVEL FARMLAND ADAPTED FOR PERSONAL FITNESS AND ARCHERY AREA
3. LEVEL PASTURE ADAPTED FOR BASEBALL AND PARADE FIELD
4. MINEBROOK PROVIDED WATER SUPPLY MINING DAM RECONSTRUCTED
5. SLOPED TERRACE PROVIDE IDEAL CAMP SITES
6. LEVEL RIVER TERRACE, FARMLAND, AND MINING COMPLEX ADAPTED FOR CAMP BUILDING AND DEVELOPMENT
7. FORMER MINING ROADS ADAPTED FOR TRAILS INTO FOREST
8. RIVER PROVIDED RECREATIONAL OPPORTUNITIES

EXTANT REMAINS ILLUSTRATING GENERAL LAND USE AND SPATIAL ORGANIZATION

- A VEGETATION, ROADS, TOPOGRAPHY
- B ADAPTED MINE BUILDING STRUCTURE RUINS BOY SCOUT BUILDING STRUCTURE RUINS
- C CAMP SITE ROADS AND BUILDING RUINS
- D DAM REMAINS
- E VEGETATION, TOPOGRAPHY, AND STRUCTURE RUIINS

NOTE: ALL OF THE BOY SCOUT BUILT OR ADAPTED BUILDINGS AND STRUCTURES WERE DEMOLISHED AND EXIST AS RUINS

Figure 1D

EXISTING CONDITIONS
LAND USE AND PATTERNS OF SPATIAL ORGANIZATION 1925-1970 BOY SCOUT CAMP PERIOD

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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RESPONSE TO NATURAL FEATURES

INTRODUCTION

As touched on in the previous section, the existing natural systems which characterize a landscape influence how a site is used, while, at the same time, how a landscape is used may alter and affect the original natural characteristics of a site. The relationship between human use and the natural landscape is usually evident to one degree or another on an historic landscape. The following section documents the existing natural characteristic of the Pahaquarry site as well as the historic "response" to those natural characteristics. How the historic use of Pahaquarry may have altered the natural characteristics of the landscape are documented as well. In some cases there is a strong relationship between historic use of the landscape and certain natural characteristics, such as the obvious relationship between the geology of Pahaquarry and the mining activity. Where that relationship is important and tangible evidence of that relationship exists, significant links are established for understanding the history of the landscape as well as determining the historical integrity of the property.

This section is also divided, when appropriate, into historical periods of development in order to address how each period of use and development "responded" to the natural conditions of the site. The description of the natural conditions of the property, however, are given as existing, since, for the most part, these natural conditions have not significantly changed over time.

The existing natural characteristics and resources of the site are also described here as an important part of developing future treatment, development, and management alternatives for the site.

GEOLOGY

Mining Period

Probably no other natural characteristic more influenced the historic use and development of the Pahaquarry landscape than geology. The three centuries of exploration for copper is directly a result of the geologic characteristics of the area. The geology of the area and its specific relationship to the last period of copper exploration at the turn of the nineteenth century is best described in the following 1911 USGS Bulletin number 455:

> The ore-bearing beds occur in the red and gray sandstones the High Falls formation, of upper Silurian age, which forms the second or northern ridge on the slopes of Kittatinny Mountain. The formation was formerly classified by the New Jersey geologists as Medina sandstone, but has recently been determined to be of Silurian age. It has an estimated thickness of 800 feet and consists of massive sandstones and interbedded shales. The strike is N. 20 degrees W.; the dip is 40 to 45 degrees W., [actually according to current descriptions, the strike appears to be plus or minus North 50 degrees East] as observed in the ravine at the Pahaquarry copper mines. The shaly

members show cleavage that dips at steep angles to the southeast, and are slaty, as may be seen at the copper mines. The harder, coarse-grained rocks show no cleavage, but exhibit numerous joint planes, which correspond to the cleavage planes seen in the more shaly beds and were formed at the same time. The prevailing colors of the High Falls ("Medina") formation are red and brownish red, but grayish green rocks appear in it in places. At the Pahaquarry mine the rocks are locally gray. The texture varies, being fine at the bottom. The top of the formation is nearly all of red shale, split by cleavage, and carrying intercalated red and gray sandstones. The shale occurs in thin beds and the sandstone in thick beds. No fossils have ever been found in these rocks in New Jersey. Copper and iron pyrite have been found in this formation at a number of places.

The demarcation between the Shawangunk ("Oneida") conglomerate and the High Falls ("Medina") formation is seen at the Warren Slate Works. The strike at this place is N. 20 degrees W. and the dip 40 degrees N. The red rock continues subordinate and is fissured and occurs mainly on the lower western slope.

THE ORE-DEPOSIT.

The region of Kittatinny Mountain has been known to be ore bearing for many years. The basal bed of the great Shawangunk ("Oneida") conglomerate which forms the bold bluffs of the mountain is very pyritous. According to Dr. Cook, late State geologist of New Jersey, the lower few inches of this conglomerate carries gold over many square miles, in places to a value as high as $11 a ton. Anywhere along the outcrop of the contact between the base of the conglomerate and the Ordovician ("Hudson") slate one can obtain pyrite ore that is rich in gold.

At the copper mine the ore beds outcrop in a ravine known as Mine Run, the lowest exposure being at an elevation of about 150 feet above the river. From this point to the height of 750 feet above sea level the rocks appear to be more or less continuously cupriferous. The portion of the formation that carries the copper consists of gray sandstones in beds from 2 feet to 6 feet thick, separated by reddish shales, usually massive and arenaceous, in beds from 6 inches to 2 feet thick. These rocks show a slight local disturbance with flexure near Mine Run, but in general the outcrops show an unusual uniformity of strike and dip. One of these outcrops, forming what is known as the "watershed," [*undoubtedly the quarry site*] is conspicuously exposed, showing in the center a surface between 30 and 40 feet wide, and having been stripped for a distance of 2,000 feet. The strike of the red shale forming this "watershed" is N. 60 degrees E. and the dip is 43 1/2 degrees N. Several crosscuts expose good sections across the various ore-bearing strata, and load workings [undoubtedly he is referring to the 1847 and 1862 workings] enable one to note the change in character of the ore in passing from the surface inward.

The copper was undoubtedly discovered by reason of the green malachite stains in the outcrop. These stains occur on joint planes and do not extend

more than a few feet beneath the surface in the workings visited. In places dark-colored nodules tend to occur on joint planes and do not extend more than a few feet beneath the surface in the workings visited. In places dark-colored nodules and balls of some what irregular form are seen in the sandstone and are found to consist chiefly of copper glance [*chalcocite* Cu_2S]. Such nodules tend to occur in local patches. The engineer in charge, Dr. Keith, states that over 100 samples, taken at different points over the property, show that the ordinary gray sandstone carries 3 per cent copper in the form of copper glance. In the richer ore this mineral can be seen in minute specks impregnating the sandstone. In the leaner ore it can not be recognized with the naked eye, but samples of the rock when pulverized can be panned and the copper glance concentrated. The ore-bearing sandstone is dense and not readily permeable, and is traversed by vertical joint planes having a direction of N. 20 degrees E., or 40 degrees to the strike. The intervening red shaly members have a splintery fracture, due to rudely developed cleavage, corresponding in direction to that of the joints in the sandstone.

The copper-bearing sandstones have been traced for 3 miles along the mountain flanks, and have been proved by workings to be cupriferous for a thickness of about 230 feet, about 10 per cent of which, or 23 feet, is red shale. The value of the deposit depends entirely on cheapness of working. The amount of low-grade material available is enormous.

The structural geology of this interesting occurrence is extremely simple, but the presence of disseminated glance in the sandstones is somewhat difficult to explain. No fossil remains have ever been found in the sandstones of this age in New Jersey, nor has any organic matter as yet been found in them.

The geology of Pahaquarry and its influence on the history and development of the property is clear. Almost the entire developmental history of the landscape can be indirectly linked to the geology of the property. The most direct evidence, however, includes the boundaries of the property and the history of land purchases. From the original John Reading property in 1753 until the Boy Scout ownership in 1925, the property boundaries reflected the location of presumed ore bearing rock. These property boundaries reflecting the mining intent followed the non-mining periods of the property through the present.

The development and modification of the ore-processing facilities at the turn-of-the-twentieth century directly demonstrates evidence of the influence of geology on the history of the landscape. The 1904 to 1912 mill employed three different processes including state of the art experimental technologies of the time in an attempt to extract the low grade ore.

Workings and mineral exploration throughout the property also clearly demonstrate evidence of the geologic influence on the landscape history, as efforts were made to find and recover profitable deposits. Profitability obviously depends on the geology of the deposit (e.g. assay value, accessibility, rock characteristics) in addition to the price of copper, and the cost and available technology to extract it. Although, with today's

technology, a three-mile ore body of three percent copper may be profitable, a confidential war-time survey by the United States Geological Survey in 1943 (see Appendix D) indicated that the value of the ore did not assay at three percent as had been previously claimed. Figures 2, 2A, 2B, 2C, 2D, and 2E (assay table 1) from this report indicate the geologic composition of the mine. This study of the mine geology sampled eight locations with a composite sample at the quarry site which is the most mineralized area according to the report. The report concluded that the average assay of the deposit was O.22 percent copper. Using a tonnage factor of thirteen cubic feet per ton, there were approximately 2,000,000 tons of minable resources (although a New Jersey State Department of Conservation and Development report of 1944 estimated a 10,000,000 ton deposit). The study recommended that, although the tonnage was large, the grade was too low to warrant further work, i.e., recovery costs would outweigh the market value of the deposit. This recommendation was again confirmed by the Bureau of Mines in 1950.

Ironically, the eventual inability to recover the finely disseminated ore over at least the last two centuries is probably most responsible for preservation of the evidence of three centuries of effort. Had the ore been higher grade, the early efforts to mine it would likely have been obliterated.

Post Mining Periods

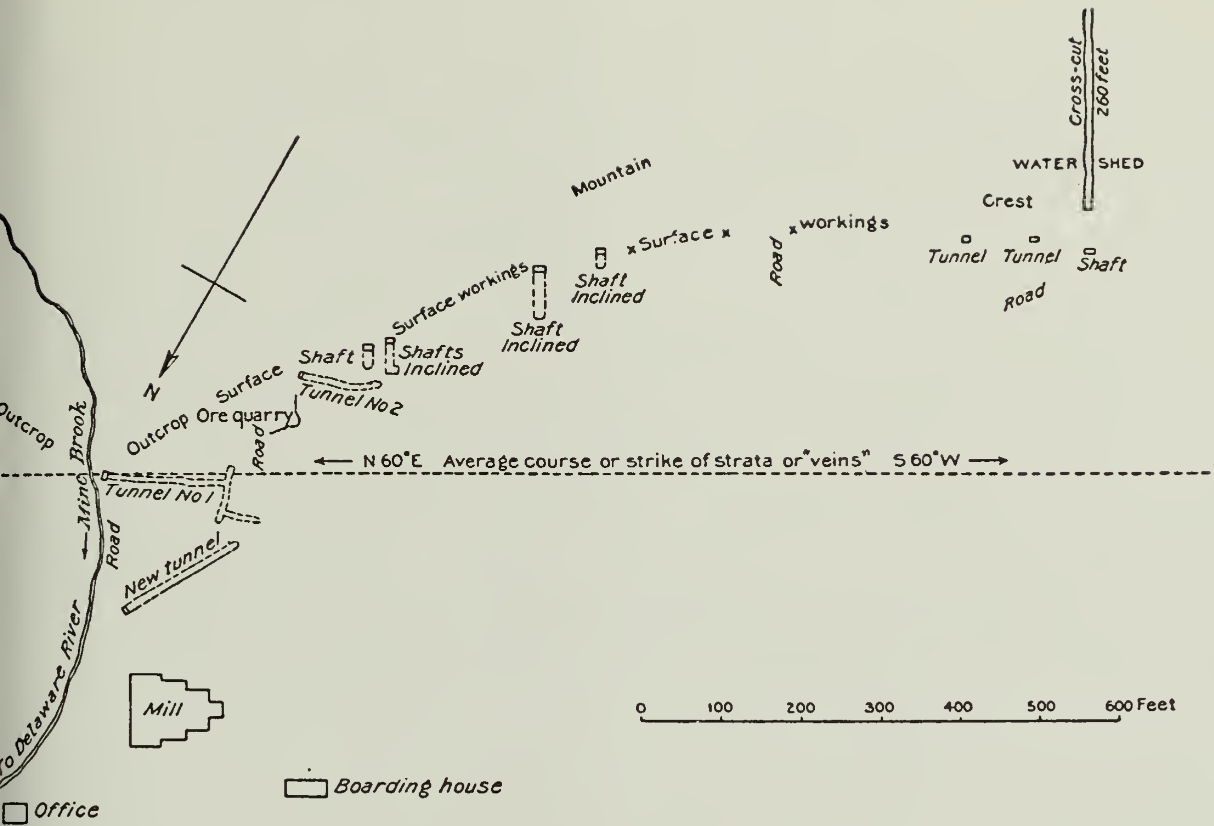
Development of the property after the end of mining was less directly influenced by its geologic characteristics. It is worth noting, however, that the development which was established as part of the earlier mining response to the geology did get adapted as part of the later patterns of use and development.

SOILS

There is no clearly evident historic "response" to the soils of the Pahaquarry site that strongly influenced development and particularly the mining efforts of the property. The soil characteristics did, however, play a part in some farming and grazing uses associated with the mining of the property as well as timbering of the property.

The soils of the historic Pahaquarry property are composed of primarily four types as identified in the *Soil Survey of Warren County, New Jersey*. These are Pope fine sandy loam, high bottom, 0-3 percent slope (PnA), Swartswood - Oquaga extremely stony loams, 8-15 percent slope (SxC), Rock outcrop - Oquaga association very steep (ROF), and Hazen gravelly loam, 8-15 percent slope (HfC). Figure 3A shows the distribution of these types on the site. The characteristics of these soils as well as their applicability for various commercial uses taken from the Warren County Report follows in detail:

PnA:
These are nearly level, well drained, deep soils on broad terraces along the Delaware River. The areas are fifteen to fifty acres or more in size. Most are at an elevation high enough above stream level that they are subject to flooding only about one year in fifty to 100 years.



—Map of Pahaquarry copper mine, Delaware Water Gap, Warren County, N. J.

Figure 2: Map of Pahaquarry Copper Mine 1911
Taken from USGS Bulletin 455

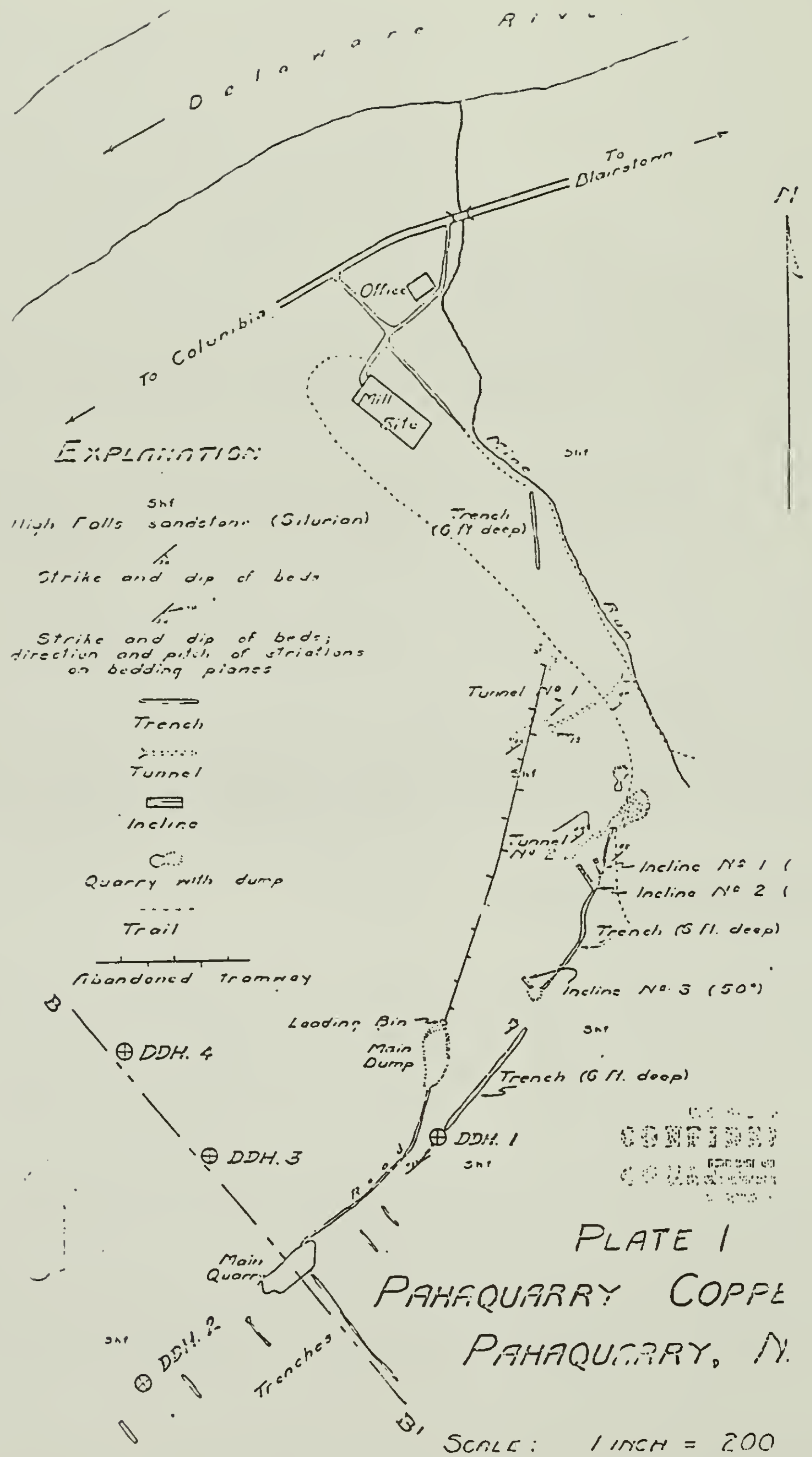
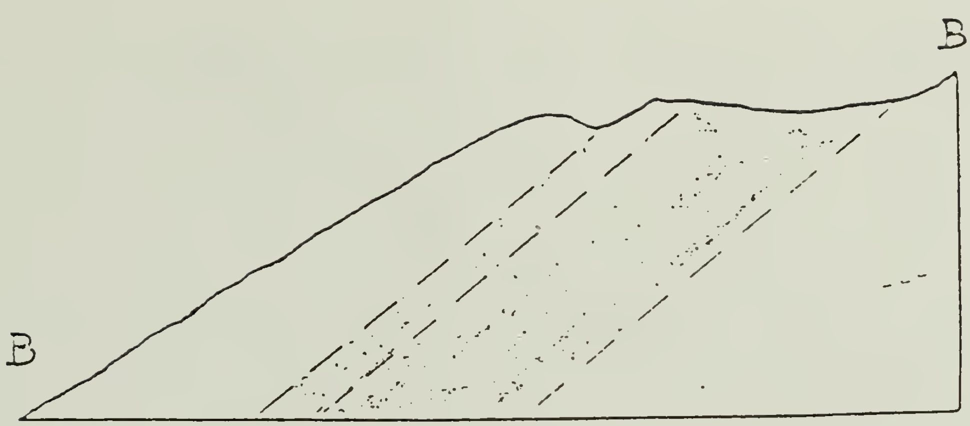


Figure 2A: Existing Conditions, Geology from USGS 1943 Report



Section B - B' 1 in. = 200 ft.

Uniform copper mineralization as indicated by 7 trenches, 3 inclines & 2 Tunnels

Uniform copper mineralization as indicated by 1 trench at main quarry

Fig. 1 Cross section B-B' of the whole area developed.

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Figure 2B: Existing Conditions, Geology from USGS 1943 Report

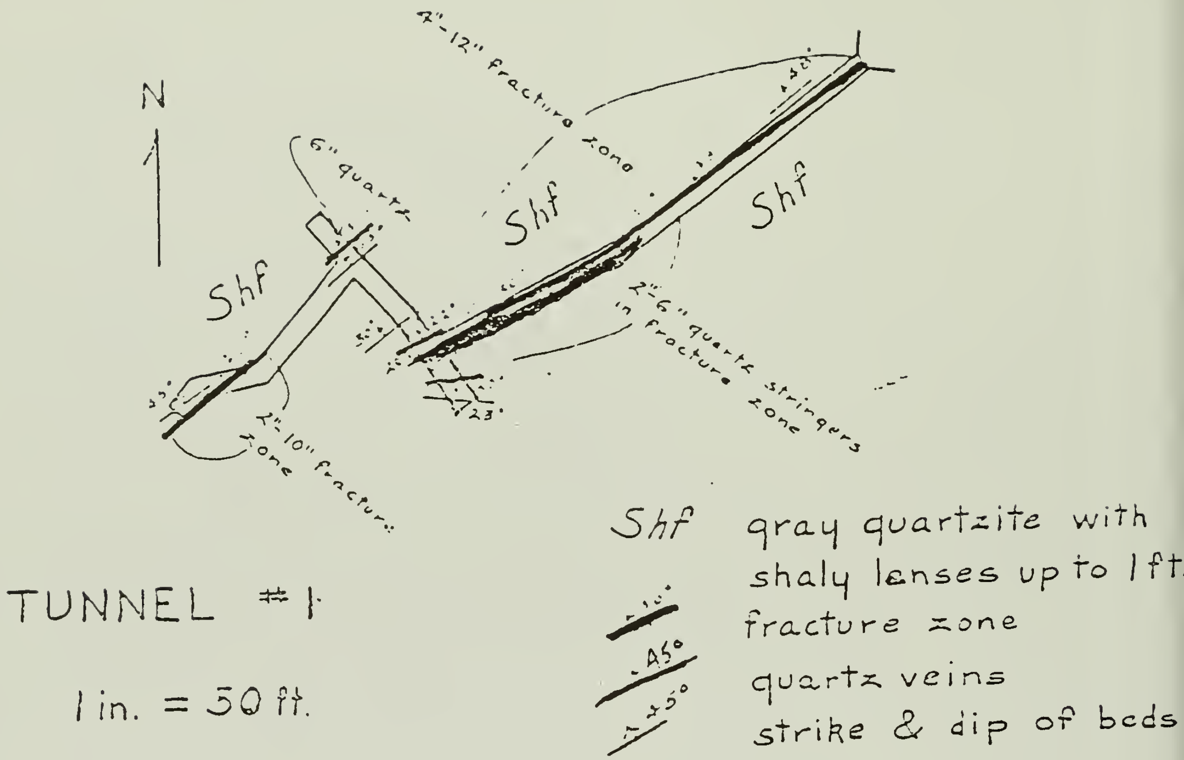


Fig. 2 Plan of Tunnel 1.

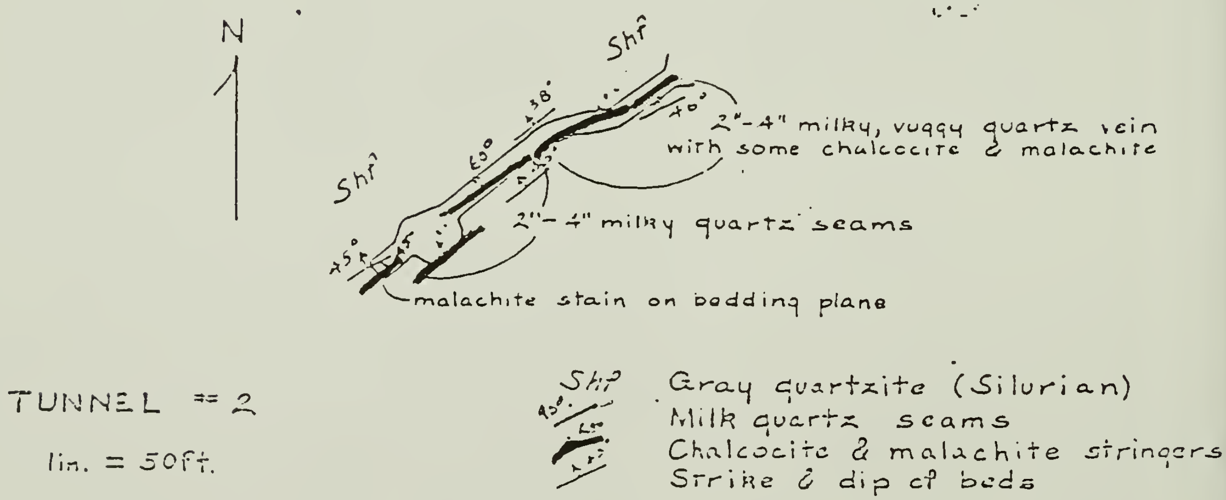
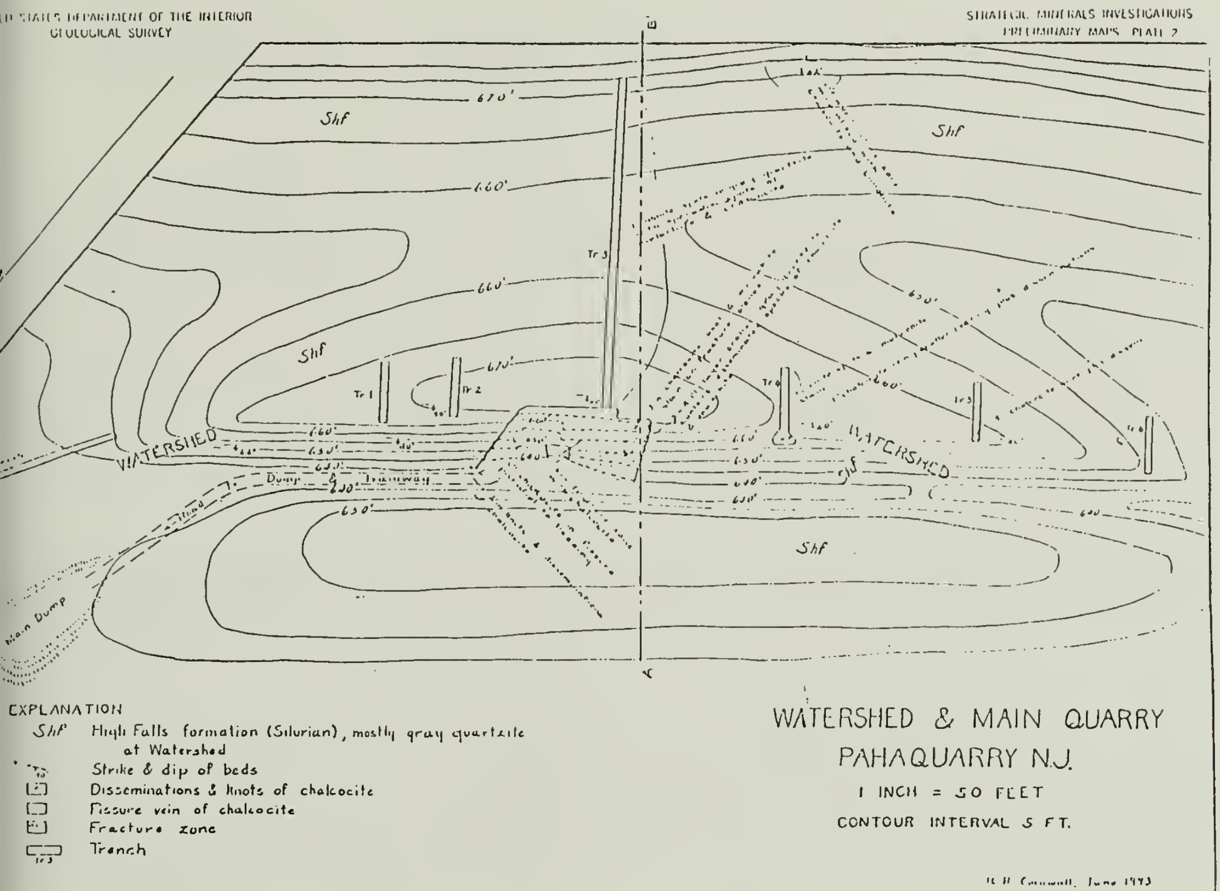


Fig. 3 Plan of Tunnel 2.

Figure 2C: Existing Conditions, Geology from USGS 1943 Report



igure 2D: Existing Conditions, Geology from USGS 1943 Report

Table 1

Rock analyses of the Pahaquarry copper mine, Pahaquarry, N. J.

mple	SiO_2	Al_2O_3	CaO	MgO	Cu	Fe	S	H_2O
C71a	75.59%	12.31%			0.19%	2.61%	0.06%	2.45%
CF1b	74.00%	13.15%			0.32%	2.65%	0.04%	2.50%
F1aNJ	74.89%	9.27%	0.79%	2.11%	0.31%			
SF2NJ	79.11%	9.23%	——	——	0.13%			
CF3NJ	80.49%	8.81%	——	——	0.12%			
SF4NJ	——	——	——	——	0.13%			
F5NJ	——	——	——	——	0.11%			
F6NJ	——	——	——	——	0.24%			
F8NJ	——	——	——	——	0.35%			

igure 2E: Assay Table from USGS 1943 Report

Typically, the surface layer is dark brown, fine sandy loam about nine inches thick. The subsoil is dark brown, friable, fine sandy loam about twenty-seven inches thick. The substratum is dark, reddish brown, light fine sandy loam to a depth of sixty-five inches or more.

Mapped areas may include some areas of Pope gravelly fine sandy loam; some areas of soils similar to Pope soils, except that they have a sand or loamy sand substratum below a depth of thirty inches; and soils in low positions that have a seasonal water table. These areas often need to have the drainage improved when used for agriculture or development.

SxC:
This complex is made up of sloping, deep to moderately deep, moderately well drained to excessively drained soils. It is found on low crests and side slopes of convex landscapes. The areas are ten to thirty acres or more in size. Stones make up three to fifteen percent of the surface. They are 2.5 to five feet apart.

This complex is sixty percent Swartswood soils, thirty percent Oquaga soils, and ten percent other soils. The pattern of soils is so intricate that mapping them separately in the soil survey was impractical. Swartswood soils have a fragipan in the lower part of the subsoil.

Typically, the surface layer of Swartswood soils, in a wooded area, is dark brown, gravelly loam about four inches thick. The upper part of the subsoil is dark yellowish brown and light yellowish brown, friable, gravelly loam. It extends to a depth of seventy inches or more.

Typically, the surface layer of Ozuaga soils, in a wooded area, is pinkish gray channery loam about four inches thick. In the upper six inches, the subsoil is brown channery loam. The lower part is reddish brown channery loam about fourteen inches thick. The substratum is brown very channery loam about six inches thick. It is underlain by shale and sandstone bedrock at a depth of about thirty inches.

Included in the mapping of this soil are a few areas of Swartswood gravelly loam and stony loam with three to eight percent slopes and eight to fifteen percent slopes with scattered areas of Wurtsboro soils in slight depressions and in seep spots along the boundary of other soils. Also included are a few ledges of red sandstone and red shale bedrock.

ROF:
This association is composed of Rock outcrop and very steep, somewhat excessively drained to well drained, moderately deep soils on the crest and upper side slopes of Kittatinny Mountain. The areas are twenty to fifty acres or more in size. Stones cover as much as fifteen percent of the surface and are 2.5 to five feet apart.

This association consists of thirty percent Rock outcrop; fifty percent Oquaga extremely stony loam; twenty percent deep well drained Swartswood extremely stony loam and other soils with variable drainage and variable slopes.

Typically, rock outcrop consists of interbedded hard red sandstone and soft red shale that are closely associated with tilted beds of quartzite. Rock outcrop supported very few, good quality commercial trees.

Typically, the surface layer of the Ozuaga soils in a wooded area is pinkish gray channery loam about four inches thick. The subsoil is brown and reddish brown channery loam about twenty inches thick. The substratum is brown, very channery loam about six inches thick. Reddish brown sandstone and shale bedrock are at a depth of thirty inches.

These mapped tracts include areas of Swartswood extremely stony loam, generally between ridges. Also included are somewhat poorly drained soils in low depressions.

Some areas of this association are dominantly Rock outcrop, and others are dominantly Oquaga soils. Rock outcrop and the soils, however, occur in each area.

Oquaga soils have moderately rapid permeability. The available water capacity and natural fertility are low. The surface is extremely stony. Reaction is strongly acid or very strongly acid.

HfC:
This sloping, well drained, deep soil is on low kames. The areas are irregular in shape and in length and are five to forty acres in size.

Typically, the surface layer is very dark grayish brown, gravelly loam about six inches thick. The subsoil is yellowish brown and dark brown, gravelly loam about twenty-two inches thick. The substratum is stratified layers of dark brown gravelly sand to a depth of seventy inches or more.

Soils included in the mapping of this area may include Hazen loam and areas of the less sloping Hazen gravelly loam. Also included are areas of seepy Hero soils along the contact with wetter soils and in some closed depressions. Some eroded cropland is also included. Permeability and the available water capacity are moderate. Runoff is medium. Reaction is naturally medium acid to slightly acid when lime is not applied.

HkA:
This nearly level, moderately well drained, deep soil is on broad, nearly oval or long, narrow outwash terraces and stream terraces. The areas are five to fifteen acres or more in size. Areas adjacent to major streams are subject to occasional flooding.

Typically, the surface layer is dark brown loam about ten inches thick. The subsoil is dark yellowish brown, fine sandy loam and gravelly fine sandy loam twenty inches thick and has mottles in the lower part. The substratum is mottled, dark grayish brown, stratified gravelly loamy sand to a depth of sixty-five inches or more.

Included in the mapped areas are Hero soils that have a surface layer of gravelly loam or gravelly fine sandy loam. Also included are areas of Hazen and Palmyra soils in the highest positions and areas of Fredon and Halsey soils in low positions.

Permeability is moderately rapid in the surface layer and subsoil and rapid in the substratum. The soil has a moderately high seasonal water table from November to April. The available water capacity is moderate, but additional water is available because of the seasonal water table. Irrigation generally benefits high-value vegetable crops. Runoff is slow, and the hazard of erosion is slight. In most places, bedrock is at a depth of more than six feet. Natural fertility is medium. Reaction is medium acid to neutral in the solum and medium acid to mildly alkaline in the substratum, if lime is not applied.

As can be seen in the soil map Figure 3A, most of the historic mining property is composed of ROF soil type. This soil is poorly suited for farming and was therefore never used for that purpose. The soil does, however, adequately support woodlands for timber production and these higher benches were undoubtedly extensively logged during the late 1860s by Aaron Keyser and again to a lesser extent in the early 1920s. The majority of the historic mining property is composed of this soil type.

The area identified as PnA soil type has had a more visible and slightly more direct influence on development at the Pahaquarry site historically. These soil areas are very suitable for farming and have been used as such from colonial times through all the mining periods of Pahaquarry. Only a small amount of this type of land was ever owned, however, at any time by any of the mining interests. During the Boy Scout use of the site, these areas were maintained as open. Only since the present Army Corps of Engineers and NPS period have these areas become fallow and allowed to begin a return to forest.

TOPOGRAPHY

The topography of the Pahaquarry site is composed of gently sloped river terraces and a series of rocky ridges and outcrops forming part of the second or northern ridge on the slopes of Kittatinny Mountain. These steep slopes are interrupted by periodic ravines including Mine Brook. Figure 3A shows the topography of the historic mining property.

The topographical character of Pahaquarry has had an influence on historical development which is still evident today. This can be seen at the historically developed sites where contours often influenced construction, as well as the entire vehicular and pedestrian circulation system.

1750s Mining Period

Since the 1700s, the flat river terraces provided ideal farming and development lands as previously mentioned. It was during this time that a two-acre property was purchased on the terrace "ideally suited" for constructing mine buildings and providing access to the river for shipping ore. Advantage was undoubtedly also taken of the small flat area along Mine Brook where the mill and race is thought to have been located. The steep fall of Mine Brook would have provided ideal topography for powering a mill race. During the 1750s period of mining activity, it is also assumed that the precipitous slopes must have caused difficulty in transportation of material given the steepness at the location of the workings.

829 Mining Period

.ittle is known of the extent of work done during this period, if any. It is believed, .owever, that little was done and, therefore, the topographic influence on any development /as minimal.

847-1862 Mining Period

)uring the 1800s period of mining exploration, the same response to the topographic haracter is made in development of the property when the level terrace fronting the river /as selected for constructing mine buildings. The steepness of the slopes limited ease of ransportation from the workings as witnessed by the existing steep road constructed uring this period to provide access to the workings.

901-1912 Mining Period

)uring the 1901 to 1912 mining period, the topographic character of the site had a more ignificant influence on development corresponding to the greater level of development of he property. Transportation of the ore to the mill was achieved using a tram which took dvantage of a gravity system created by the steepness of the slopes. This same opographic character required constructing a significant cut through solid rock to get an ven grade of track for this tram. The mill itself also used the topographic character of the roperty in both its location and construction. Like most mills of its day, it was onstructed in successive floors up the side of a hill to make use of gravity to feed the ore own successive levels of treatment. A presumed storage building of some type and the oil torage building, later adapted by the Boy Scouts, were located in the hill to take dvantage of earth sheltering. The rest of the building development was located as in revious mining efforts to take advantage of the level areas along the lower terrace and nouth of Mine Brook for construction and better farming and pasture land.

'he Boy Scout Era 1925-1970

'he last period of active use and development of the property by the Boy Scouts took some dvantage of the topography of the site in locating the various camp sites and facilities of he camp. Most of the support facilities, following the pattern established by the previous nining use, were located along the level river terrace while the majority of the campsites /here located on the higher wooded slopes. The chapel was strategically placed on a high oint.

'or all of the significant mining periods, the relationship and response to the topographic haracter of the site as identified above is still very much evident.

VEGETATION/FAUNA

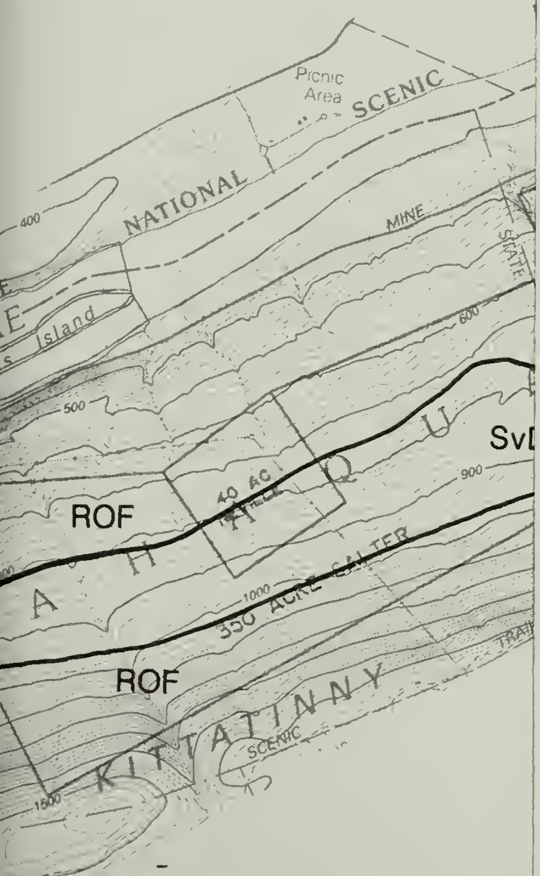
Vegetation has apparently had limited influence on the historical development of the Pahaquarry mining property except for the benefit of a ready supply of timber in support of fuel and construction during the mining periods and the small amount of farming associated with the level floodplain at the mouth of Mine Brook. This level floodplain is first mentioned as having been cleared by Dickeson in 1862 and was probably cleared as early as 1847. The slope above the river terrace, approximately above Old Mine Road, as shown on existing conditions figure 1B, was cleared for pasture probably after the 1830s but abandoned by the 1880s. Evidence of the use of these upper benches still exists from the remains of rock rows. These are identified on existing conditions figures 6C and 6D. These areas, however, were adjacent land owned by local farmers and never part of the mining lands.

In 1861 in his report Dickeson described the Alleghany Mining Company land as a "large body of contiguous mountain land, densely covered with forest...," while about thirty acres had been partly cleared and fenced. It appears that the first significant timbering of the properties associated with mining at Pahaquarry occurred between 1867 and 1890. Another brief period occurred between 1920 and 1922. During these uses, development of the property was minimal. A house, probably a shack, was owned by Aaron Keyser on the top of the ridge during his ownership from 1867-1890. Remains of this house were looked for during field investigations for this report, however, neither the site, or any remains were found. Between 1920-1922, the mill was adapted as a saw mill for barrel staves and construction of a brick building occurred near the former Pahaquarry Mining Company blacksmith shop. This building is believed to be under the existing remains of the later Boy Scout era mess hall concrete slab.

Probably except for composition and age of the stand, the essentially forested character of the property, has changed little. Even during the longer period of timbering when Aaron Keyser logged the property, he was apparently interested in cutting only the oak and hemlock trees for their bark to use in his tannery. Also, the chestnut blight around the turn-of-the-twentieth-century would have changed the domination of the forest from American chestnut.

A detailed study of the vegetation of the former mining property was done as a part of this CLR and is included in Appendix I. Figure 4A from this report illustrates the plant communities of the area along with the successional age of the community and land use influences. This report characterized the vegetation of Pahaquarry as:

> an upland forest dominated by white oak, red oak, and black oak in varying proportions. Both the chestnut oak and the scarlet oak are also present. This forest canopy ranges from sixty to one hundred feet tall. Other canopy trees present include hickories, red maple, sugar maple, ash, tulip tree, beech, black cherry, sweet birch, black gum, and elm. Below the upper canopy layer is a second group of sweet birch, black gum, and elm. Below the upper canopy layer is a second group of understory trees at a height of thirty to forty feet. These include dogwood, hop hornbeam, sassafras, ironwood, and American chestnut sprouts. The shrub layer includes maple-



PnA — Pope Pine Sandy Loam, High Bottom, 0-3% Slopes

SxC — Swatswood-Oquaga Extremely Stony Loams, 8-15% Slopes

ROF — Rock Outcrop-Oquaga Association, Very Steep

HfC — Hazen Gravelly Loam, 8-15% Slopes

SvB — Swartswood Very Stony Loam, 3-8% Slopes

SvD — Swartswood Very Stony Loam, 15-25% Slopes

ORD — Oquaga-Swartswood-Rock Outcrop Association, Steep

SVC — Swartswood Very Stony Loam, 8-15% Slopes

Figure 3A

EXISTING CONDITIONS

SOILS

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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NOTE: THIS PLAN IS A COMPOSITE OF ALL AVAILABLE DEEDS AND PLANS. THE BEARINGS AND DISTANCES SHOWN ARE DEED DIMENSIONS OR MATHEMATICAL SOLUTIONS DERIVED FROM CONSTRUCTING THIS ABSTRACT.

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EXISTING CONDITIONS
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leaved viburnum, black haw, arrowwood, spicebush, witch hazel, beaked hazel, and red and gray dogwoods. In acid soil areas, blueberries, huckleberry, and pinxter flower are found. Vines include poison ivy, Virginia creeper, Japanese honeysuckle, and wild grape.

In the dry ridgetops, the chestnut oak forest can be found. In some ridgetops of the higher elevations (such as along the top of Kittatinny Mountain) a pine-scrub oak forest can be found. In wetlands, lowlands and in floodplains, forests are dominated by yellow birch, red maple, ash, basswood, tulip tree and black gum. Box elder and river birch are also found in the floodplains. Common shrubs include alder, willow, buttonbush, spicebush and witch hazel. Herbs include skunk cabbage, spring herbs, sedges and mosses.

Hemlocks dominate steep ravines and north facing slopes in association with black birch, red maple, and sugar maple, and, to a lesser extent, white ash.

The area of greatest concentration of mining era building and structural remains, which was formerly disturbed by mining and Boy Scout development at the mouth of Mine Brook, is currently dominated by an early successional association. This association is dominated by shrub and herbaceous species including exotic species. These include blackberry, black cherry saplings, autumn olive, honeysuckle, and the herbaceous layer of goldenrod, pokeweed, and foxtail grass. The portion of the stream between Old Mine Road and the Delaware River is overgrown with an occasionally dense growth of poison ivy, hayscented fern, Japanese barberry, and horseweed.

Another detailed study was done of the site around Mine Brook to survey rare or endangered species. This report completed in September of 1993 is included in Appendix J. The study area did not evaluate all of the historic property associated with mining at Pahaquarry but evaluated the area around Mine Brook. The study found one threatened long-tailed salamander and a state declining species of northern spring salamander. No rare birds were seen at the site, however, declining species found include the ovenbird, red-eyed vireo, wood thrush, and the scarlet tanger. The mine tunnels were identified as potential habitat for the endangered Indiana myotis bat as well as other species of bat. In addition, a small population of the state listed rare Long Beech Fern was found along Mine Brook. The location where these rare or endangered species were seen are identified on the "Treatment Alternatives Natural and Cultural Resource Concerns" Figures 7A and 7B.

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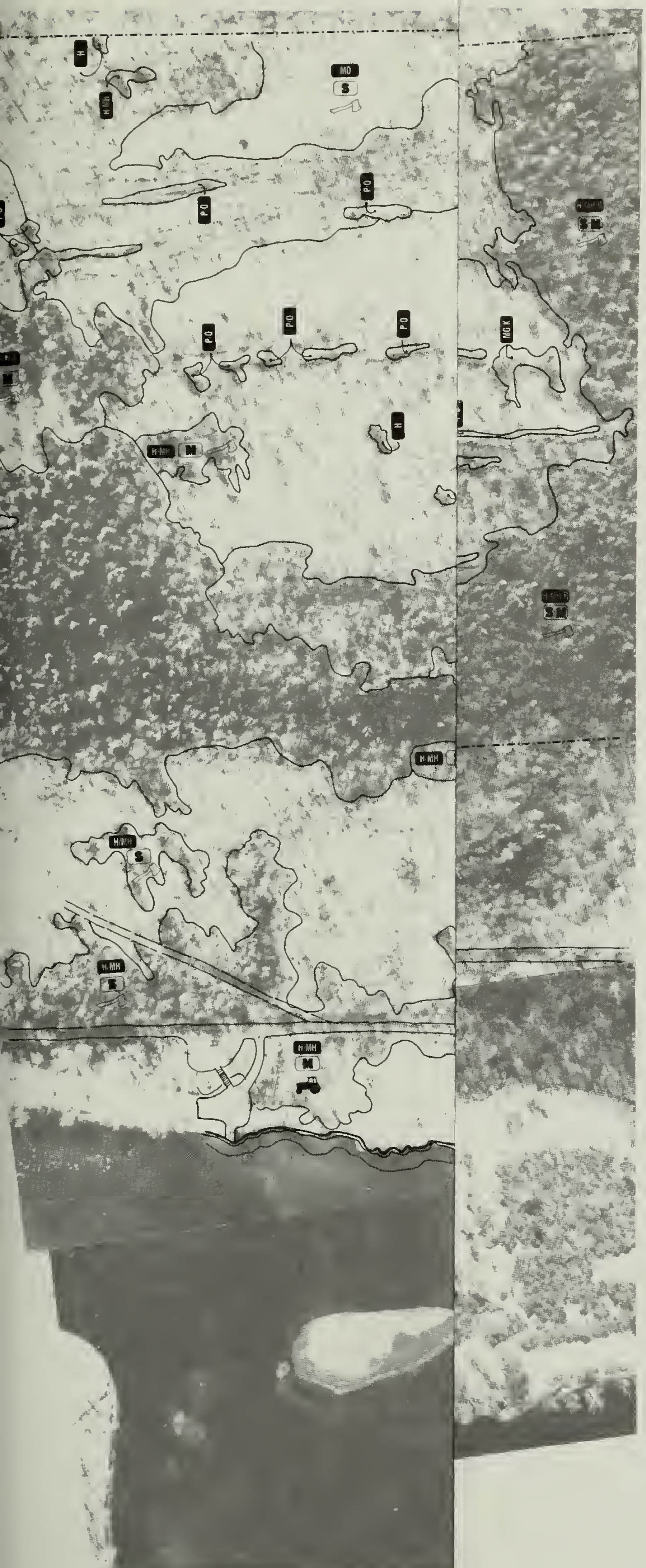

VEGETATION ASSOCIATIONS

MIXED OAK ASSOCIATION

MO	Mixed Oak Forest
MO/K	Mixed Oak/Kalmia
CO	Chestnut Oak Forest
CO/R	Chestnut Oak/Rhododendron
MH	Mixed Hardwoods
MH/R	Mixed Hardwood/Rhododendron

HEMLOCK ASSOCIATION

H/MH/R	Hemlock/Mixed Hardwood/Rhododendron
H/MH	Hemlock/Mixed Hardwood
H/CO	Hemlock/Chestnut Oak
P	Hemlock

BLACK BIRCH ASSOCIATION

BB/MH	Black Birch/Mixed Hardwood
MB/R	Mixed Birch/Rhododendron

OTHER

P/O	Pine/Oak
P	Pine Plantation
BR	Bare Rock
BS	Bare Soil
S/R	Successional/Ruderal

TYPE OF DISTURBANCE

Selective Cut	=	Evidence of selective logging or cutting
Cutting	=	Major timber removal
Fire	=	Evidence of fire
Mining	=	Disturbance from general mining activity including excavation and road clearing
Mine Spoil	=	Disturbance from mine spoil piles and rock slides
Rock Slide	=	Disturbance from rock slides on steep slopes
Farming	=	Disturbance from past farming activity
Pasture	=	Disturbance from former pasture land use

DEGREE OF DISTURBANCE AND SUCCESSIONAL STATE

V	Virgin, undisturbed (over 300 years)
S	Slight, light grazing, selective cuts of a few years ago (mature 200-300 years)
M	Moderate, older secondary forest (100-250 years)
H	Heavy, young secondary forest growth (25-150 years)
E	Extreme, old fields, recently burned areas, bomb craters, etc. (0-50 years)

0 100 200 400 FEET

figure 4A

VEGETATION MAP

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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VEGETATION ASSOCIATIONS

MIXED OAK ASSOCIATION

- MO — Mixed Oak Forest
- MO K — Mixed Oak/Kalmie
- CO — Chestnut Oak Forest
- CO R — Chestnut Oak/Rhododendron
- MH — Mixed Hardwoods
- MH/R — Mixed Hardwood/Rhododendron

HEMLOCK ASSOCIATION

- H/MH/R — Hemlock/Mixed Hardwood/Rhododendron
- H/MH — Hemlock/Mixed Hardwood
- H/CO — Hemlock/Chestnut Oak
- P — Hemlock

BLACK BIRCH ASSOCIATION

- BB/MH — Black Birch/Mixed Hardwood
- MB/R — Mixed Birch/Rhododendron

OTHER

- P/O — Pine/Oak
- P — Pine Plantation
- BR — Bare Rock
- BS — Bare Soil
- S/R — Successional/Ruderal

TYPE OF DISTURBANCE

- Selective Cut = Evidence of selective logging or cutting
- Cutting = Major timber removal
- Fire = Evidence of fire
- Mining = Disturbance from general mining activity including excavation and road clearing
- Mine Spoil = Disturbance from mine spoil piles and rock slides
- Rock Slide = Disturbance from rock slides on steep slopes
- Farming = Disturbance from past farming activity
- Pasture = Disturbance from former pasture land use

DEGREE OF DISTURBANCE AND SUCCESSIONAL STATE

- V — Virgin, undisturbed (over 300 years)
- S — Slight, light grazing, selective cuts of a few years ago (mature 200-300 years)
- M — Moderate, older secondary forest (100-250 years)
- H — Heavy, young secondary forest growth (25-150 years)
- E — Extreme, old fields, recently burned areas, bomb craters, etc (0-50 years)

0 100 200 400 FEET

figure 4A

VEGETATION MAP

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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CULTURAL TRADITIONS

Cultural influences which may be evident in a historic mining landscape usually include areas such as traditions, technology, construction techniques, and social organization. These influences are visible in the mining landscape of Pahaquarry to varying degrees despite the ruinous or archeological state of most of the features of the site. The cultural traditions evident at the site are discussed for each historic period.

MINING ERAS

1750s Mining Period

The traditions, technology, and construction techniques, associated with mining are closely related. Although not many of the buildings or structures remain above ground from this period, the features which do remain, along with their landscape context, provide evidence of these cultural influences on colonial mining. These include dry-laid stone dams and a race, which powered a stamp mill of similar technology as grist mills of the time, hand drilled and dug adits and exploratory shafts, water and pack animal transportation routes.

The siting and its development is also evidence of the mining technology of this period. The siting was ideal from an early technology perspective. The river provided good transportation, Mine Brook provided a source of power for the mill, timbered land provided fuel, and good agricultural land and nearby farms provided the necessary requirements for subsistence living. These exploratory efforts, ironically, also exhibit the limited geological knowledge of the time given the unlikelihood of profitably extracting the low grade ore of the site during this period.

Evidence of specific construction techniques for buildings during this period is limited because none of the mining buildings have survived. It is possible that archeological evidence may survive, however, even the lack of buildings is evidence of the cultural traditions of the period and the lack of permanence that would have been associated with these buildings.

Renewed Mining 1829

Little disturbance is thought to have occurred at this time and, therefore, indications of cultural influences on the landscape are not discernable. Any evidence from this period, however, would have reflected a similar technology as the earlier colonial effort.

1847-1862 Era of the Alleghany Mining Company

Mining and building technology had not changed a great deal by this time from the colonial period. Most of the mining was still done laboriously by hand in underground hard rock mines to extract the ore. Steam power, however, was in use and would have powered mills of this period although not at Pahaquarry. Blasting had been improved with the use of improved fuses. Steel also brought greater efficiency to the drill bits and geologic knowledge had advanced. Application of this technology is visible in the exploratory work of this period. Application of building traditions is also evident in the siting of these structures on the level river terrace and of their small scale typical of the period.

In spite of somewhat greater efficiency in technology at this time, what is most evident in the cultural expression at Pahaquarry, is the speculative nature of mining during this period and especially as the lack of any high grade ore became evident. This can be seen in the lack of any milling equipment construction, the exploratory nature of the workings, and especially the property exchanges and boundary expansion which occurred. The property boundary which eventually became a part of the Delaware Water Gap National Recreation area was, for the most part, established at this time.

From a technological point of view during this period, the site, as in colonial time and for the same natural characteristics of the property, seemed ideal for mining. The inability to find a high grade ore or extract the low grade ore did not greatly limit the speculation. This is still very much evident in the site today.

Although the mine buildings no longer exist, the sites of these buildings may yield archeological evidence of the cultural traditions of the period.

Pahaquarry Mining in the Twentieth Century 1901-1912

The visible evidence in the landscape of the cultural traditions of the industrial age including technology, innovations, construction techniques, economic forces, and social organization, is extensive for this period of copper exploration. During this period the technology of mining had made significant progress and the ability to extract ever lower grades of ore was improving. New milling processes were developing, knowledge of metallurgy and geology had advanced, and power sources were improving including the application of electric power. Rail and road transportation were replacing river and canal transportation for greater economic efficiency and automobiles were coming into wider use. The modern industrial age was both fueling the demand for metals and making profitable there extraction. At the same time the economy and the labor force was also becoming more concentrated around industry. Labor classes and social stratification were being reflected physically in the organization and construction of industrial sites. At Pahaquarry all of these influences are evident for this period to varying degrees in the landscape and extant ruins.

The mine workings during this period began with a new tunnel 300 feet long and reworking of the first adit, dug no longer by hand, but by the use of more efficient gas powered electric drills. Blasting improved with the use of dynamite ignited with small, portable electric detonators. Soon even this technology and method of mining had changed

along with greater geologic knowledge to develop open quarry mining of greater quantities of lower grade ores. The quarry site had the greatest percentage of low grade copper ore. Although the grade was low, in the end way too low, there was much of it. The faith that existed, however, in the new technologies and innovations in milling process is still evident today in the remains of the mill. The mill reflects an attempt to use three different process at extracting the finely disseminated copper mineral. Two of the processes, including the first, were experimental or at the forefront of mill technology. These processes and changes in the construction of the mill can still be traced in the existing ruins.

In addition to the mill and exploration sites, other evidence in the landscape of technological application include the development of the double-track gravity tram system, and the water supply system. This system was used to supply water to the mill and other needs and eventually involved the use of electrical pumping from the river to replace the dams which had become inadequate to supply the amount of water needed in the new flotation system.

The supporting development of the operation including the housing, office, barn and pasture, oil house, powder house, blacksmith shop, ice house, and tipple building also are evidence of the mining technology of the time. Although much of the evidence of these buildings has been lost, some of the above ground remains and the landscape context and organization conveys the technological application of this mining effort.

The social and labor class stratification which was common in industrial sites was also being reflected in an abbreviated way at Pahaquarry. This is evident in the organization and construction of the separate housing accommodations for company laborers and higher skilled employees and company officials. This stratification is more distinct from that of the colonial mining effort which apparently exhibited less class distinction. This can be gleaned from less intensive building development in the colonial period.

TIMBER CUTTING, THE BOY SCOUTS, AND PUBLIC ACQUISITION PERIOD 1920-1970

These periods involved, for the most part, an adaptation of the previous mining development. The timbering effort was so short and minimal that little cultural expression was made to the site from this period. Eventually the Boy Scouts began to express their distinct cultural traditions, technology, and influences on the former mining property. These are evident in the various remains, development adaptations from the previous eras, and new developments made by them in the landscape. The specific extant landscape features from this and the earlier mining periods are documented in the following existing conditions circulation and buildings and structures sections.

CIRCULATION NETWORKS

The existing circulation network on the site represents a range of paths and roads from the periods of mining activity to the present and, from limited visible evidence, to entirely extant features. For clarity of documenting the existing condition, the circulation networks are discussed here for both the mining eras and Boy Scout to the present periods. The discussion will correspond to Figures 5A, 5B, 5C, and 5D for the mining periods, and Figure 6E for the Boy Scout period, which illustrate the existing conditions of the site circulation.

MINING ERAS

1750s Mining Period

Undoubtedly, a road system existed as part of the first mining activity at Pahaquarry in the 1750s that connected the mine workings with the mill site, (the location of which is estimated on Figure 5A, number 26.) the building complex on the two acres near the river, and the river. A path system would have also existed connecting various buildings in the complex that existed on the terrace above the river on the two-acre lot owned by the colonial mining interests. A path system also likely existed as part of the mill complex. A few of the roads or paths thought to be from this period have been identified.

One path, shown as number 13 in Figure 5A and number 2 in Figure 5B along Mine Brook, can be identified as possibly dating from the 1750s mining era. This speculation is based on the fact that a road existed along Mine Brook to the lower mine in 1862. Since the lower mine tunnel is known to have been the workings of the 1750s, and the creek and landform provide few alternatives for the road alignment, it is likely that at least part of the existing path closely follows one that would have existed in the 1750s. At some point the path would likely have crossed Mine Brook to connect to the mill probably located on the opposite side of shaft number one. Figure 5B, number 2, and Photos 7 and 8 show stone work placed as part of construction of a retaining wall for this road although it is not known when this work was done since this road has apparently been in continuous use since the 1750s.

Portions of this road are currently used as a hiking trail and it is in good condition. Although some of the alignment is likely original, the road has undoubtedly changed width and elevation through time as a result of erosion. This erosion is especially likely after area logging increased runoff and velocity of Mine Brook.

Another likely road or path from this period is the route which connects the current Keyser trail to the upper mine adit number 2. This early path is identified on Figure 5B, number 5. This path connects directly to the adit and the workings above and below the adit all of which date from this earliest mining period. Since it is likely that some circulation connection would have been needed to this area, and the terrain offers few other choices, it is probable that this route has been in continuous use since the adits were worked. It is not clear if it followed a different route where it now intersects with the Kaiser trail.

)ld Mine Road does not exist in the same alignment as it did in the 1750s. The existing oad alignment was established in 1936. In the period from the 1750s until the existing lignment was established, the road had at least three different alignments. The earliest lignment shown for the road is along an upper bench. In an 1830 survey (Illustration 21), he road was relocated from this upper alignment to an alignment along the river. This ater location is shown on an 1874 Beers map (Illustration 22). The upper alignment of Old Aine Road, which was abandoned in 1830, is most likely the trace that is still barely vident today as identified on Figure 5A, number 15 and photos 5, 6, and 7. This lignment may or may not have existed as far back as the 1750s. It does, however, connect he speculated area of the mill site and property owned during this time to the north and ast.

s identified on Figure 5A, numbers 15 and 16, photos 5, 6, and 7, and Figure 6A, photos 1, 22, and 23, where this pre-1830s road trace crosses Mine Brook, remains of a former ridge abutment are also extant. As the road trace climbs steeply out of the Mine Brook lrainage to the east, it reaches a bench above where the trace fades. Farther to the east, bout 200 feet, the road again becomes apparent. Here, the road was apparently used by he Boy Scouts as it is much more visible and appears more recently used. The road is in air condition, however, vegetation is in the process of obscuring its location. The stone vork, apparently for the early bridge abutments, is threatened by vegetation and creek rosion. A later Boy Scout era bridge abutment exists in this same location.

n addition to the road system, which served the mines and area during this period, the)elaware river was a principle form of transportation of goods and supplies. The river, lthough it had many difficult areas to navigate when it was flowing, seems to have been convenient route. When frozen, it allowed sled transportation. The river exists, as it did luring earlier periods, and serves as a reminder of its use as a transportation route during eriods of Pahaquarry mining activity.

)evelopment in the 1847-1848 and 1861-1862 Periods

'ortions of the primary roads from this period of mining activity are evident today. The ower trace of old mine road, shown in Figure 5A, numbers 1 and 2, is clearly the road vhich existed from 1830 until the existing alignment was built in 1936. Although this road s traceable as a depression and by vegetative differences, it is quickly disappearing as ative vegetation has been allowed to grow back. Dry-laid stone walls, which were onstructed along the slopes of portions of the road, are also extant as identified in Figure A and Figure 5D, numbers 29 and 30. These are discussed in the following existing onditions section for mining period structures.

)ther evidence of this 1830 road alignment exists to the south of the existing bridge as hown on Figure 5D, number 1 and photo number 10. The road to the lower mine, number ., continued to be used through this period as discussed above. Its intersection with Old Aine Road undoubtedly changed, however, when Old Mine Road was relocated in 1830.

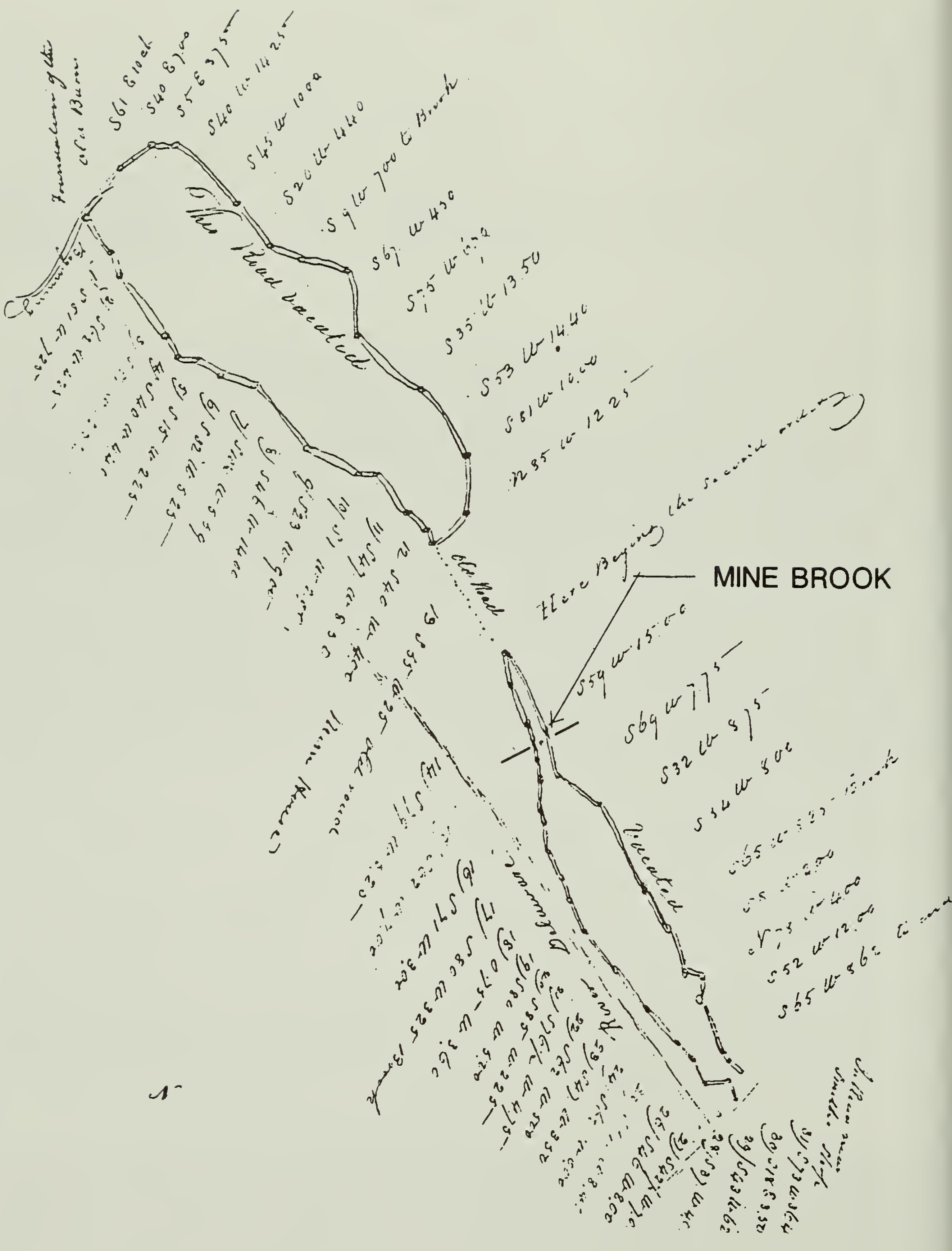
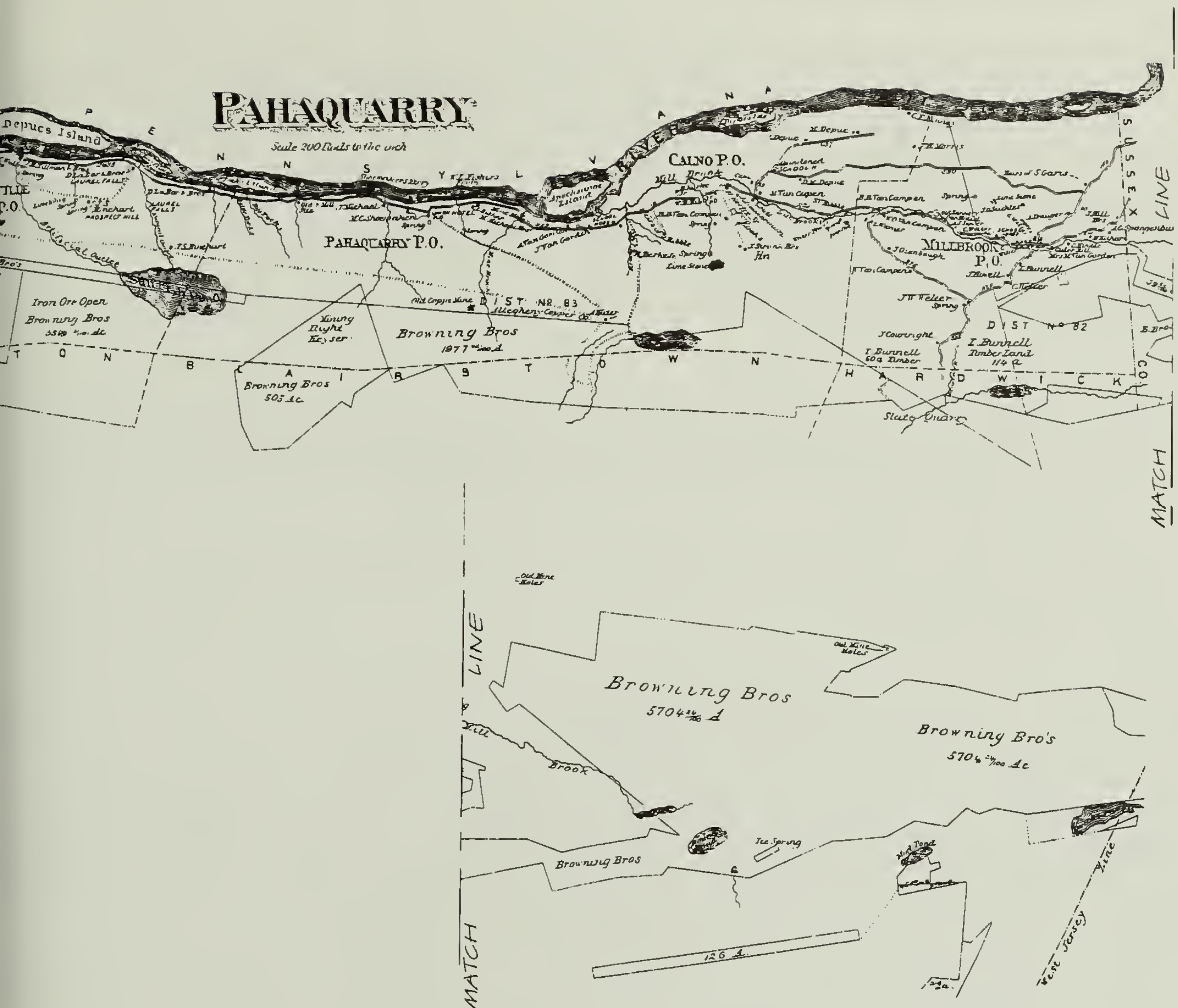


Illustration 21: 1830 Old Mine Road Survey



lustration 22: 1874 Beers' Map

For much of its length, the road to the upper mine, as described in Dickeson's 1862 report (Appendix B), is still extant as a dirt road shown on Figures 5A, number 10; 5B, number 3; and 5C, number 3, and photos 1 and 2. It is currently known as the Keyser trail, and is in good condition although steeper portions of it have begun to erode. Its intersection with Old Mine Road has probably changed as shown in the speculated alignment in Figure 5A, number 6. Another possible alignment is shown as number 8. It is unclear which of these two alignments connected to Old Mine Road. These alignments are based on the 1862 sketch for the Allegheny Mining Company (see Illustration 7) which shows the road intersecting close to the bridge.

Another likely minor road from this period exists as a remnant shown on Figure 5C, number 4. This road could have connected to the area being worked nearby and identified as numbers 2, 4-7 on figure 6C. It likely connected to the upper mine access road although the route is unclear today.

In addition to the road systems, the Delaware river, as in the 1750s mining period, was used for transportation.

Renewed Activity in the 1901-1912 Period

An extensive circulation network existed as part of the mine operation during this period which included roads, paths, and tracks for moving ore. In addition to these passageways, the river continued to serve a limited role in transporting supplies to the mine. Coal was apparently brought to the mill in winter on sleds across the frozen Delaware River rather than relying on the unpredictable muddy dirt roads in spring.

Nevertheless, by this period, technology changed the reliance on the river and the principle access to the mine was from Old Mine Road. This route had not changed from the 1847-1860s period. Other roads of this era, which also dated from the 1860s, were the upper road to the quarry site and the even earlier road to the lower mine adit.

The circulation system during this last period of mining at Pahaquarry included the following:

Mine Complex Access

The main road from Old Mine Road to the upper quarry area could have changed from a road straight from the bridge to a point just northwest of the mill (Figure 5A, number 8) to a road around the knoll to the point above the mill (Figure 5A, number 6). It is not certain which of these alignments existed for this lower section of road where it intersected with the river road prior to the early 1900s. It is more likely, however, that the route from the bridge at Mine Brook, which followed the contours around the knoll to the top of the hill above the mill, is the route that existed from the 1847-1862 period. The mine building development during the later period, then, simply adapted this pre-existing road.

Mine Building Complex Open Circulation Area

An open, wide cleared area existed for circulation between the mill, blacksmith shop, and barn buildings as shown in Figure 5A, number 9. This area has become obscured by vegetation although it is possible to discern the area by the occurrence of primary successional and exotic vegetation which corresponds to the area of this previous disturbance.

Boarding House Paths

A walkway system existed from the boarding house to the mine building complex as shown on Figure 5A, number 7. These walks are no longer visible and have become overgrown with vegetation.

Ore Car Tracks

A system of tracks was developed for moving ore from the mines to the mill during this period. As shown on Figure 5A, number 11; 5B, number 7; and 5C numbers 1, 2, and 3, the main route contained a double-track gravity tram from the quarry to the mill. The alignment of this track is still evident in topographical changes on the site, stone foundations, pilings, and the rock cut made for the track although the tracks have been removed and vegetation is overgrowing the alignment. Another track line ran from the "new tunnel," dug in 1901, to the spoil piles on both sides of the creek as shown on Figure 5A, number 14. These tracks have been removed. The waste piles, however, still exist as well as the stone walls that were used to channel the creek and provide a crossing for the tracks.

Another alignment exists from this new tunnel to the mill as identified in Figure 5A, number 12. Its exact purpose, whether a track bed or a path, is not known, although it apparently connected the 1901 new tunnel to the mill. This bed or road is topographically evident, however, forrest succession is beginning to obscure this feature.

Other minor walks which may have connected various mine operations and buildings have since disappeared as the forest has reclaimed the site.

BOY SCOUT ERA 1925-1970

The Boy Scouts, during their ownership and development of the Pahaquarra scout camp, mostly used the pre-existing mining roads. These are shown on Figure 7A "Existing Conditions Buildings/Structures/Circulation Boy Scout Era." Some changes can be seen in the road system such as the development of the road to the camping sites northeast of Mine Brook. During the Boy Scout period, probably the most significant change in the road system, was the re-alignment of Old Mine Road in the 1930s. Extensive paths and trails were developed connecting the camp facilities. Many of these paths and trails have become obscured by vegetation. Major hiking trails, and the trails to the mine tunnels are still used. These trails were adaptations of mining era roads.

PHOTO VIEW POINT

EXTANT NON HISTORIC ROAD

1901-1912 PERIOD SPECULATED ROAD LOCATION WITH NO ABOVE GROUND EVIDENCE

1860'S PERIOD SPECULATED ROAD LOCATION WITH NO ABOVE GROUND EVIDENCE

1860'S & 1901- 1912 PERIOD SPECULATED ROAD LOCATION WITH NO ABOVE GROUND EVIDENCE

SPECULATED LOCATION OF PATHWAY WITH NO ABOVE GROUND EVIDENCE

EXTANT OR ABOVE GROUND EVIDENCE EXISTING

1901-1912 PERIOD TRACKS

1901-1912 PRINCIPLE BUILDINGS KNOWN OR APPROXIMATE LOCATIONS

1 OLD MINE ROAD LOCATION AFTER 1830

2 MINEBROOK BRIDGE PRE 1936

3 BUILDING COMPLEX ACCESS

4 MINEBROOK BRIDGE

5 MINE COMPLEX ENTRY

6 MINE BUILDINGS SERVICE ACCESS AND SPECULATED ACCESS TO UPPER MINE

7 PATHS FROM BOARDING HOUSE TO WORK AREAS

8 OTHER SPECULATED ROUTE TO UPPER MINES

9 CIRCULATION AREA AROUND MILL AND BLACKSMITH SHOP AREA

10 ROAD TO MINES

11 LOCATION OF DOUBLE TRACK GRAVITY TRAM

12 SPECULATIVE ROAD FROM "NEW TUNNEL" TO MILL

13 SPECULATIVE ROAD ALIGNMENT TO LOWER MINE

14 TRACKS TO SPOIL PILE

15 1750'S PERIOD SPECULATED RIVER ROAD

16 1750'S PERIOD SPECULATED RIVER ROAD BRIDGE

0 10 20 40 80

Figure 5A

EXISTING CONDITIONS
CIRCULATION
MINING ERA

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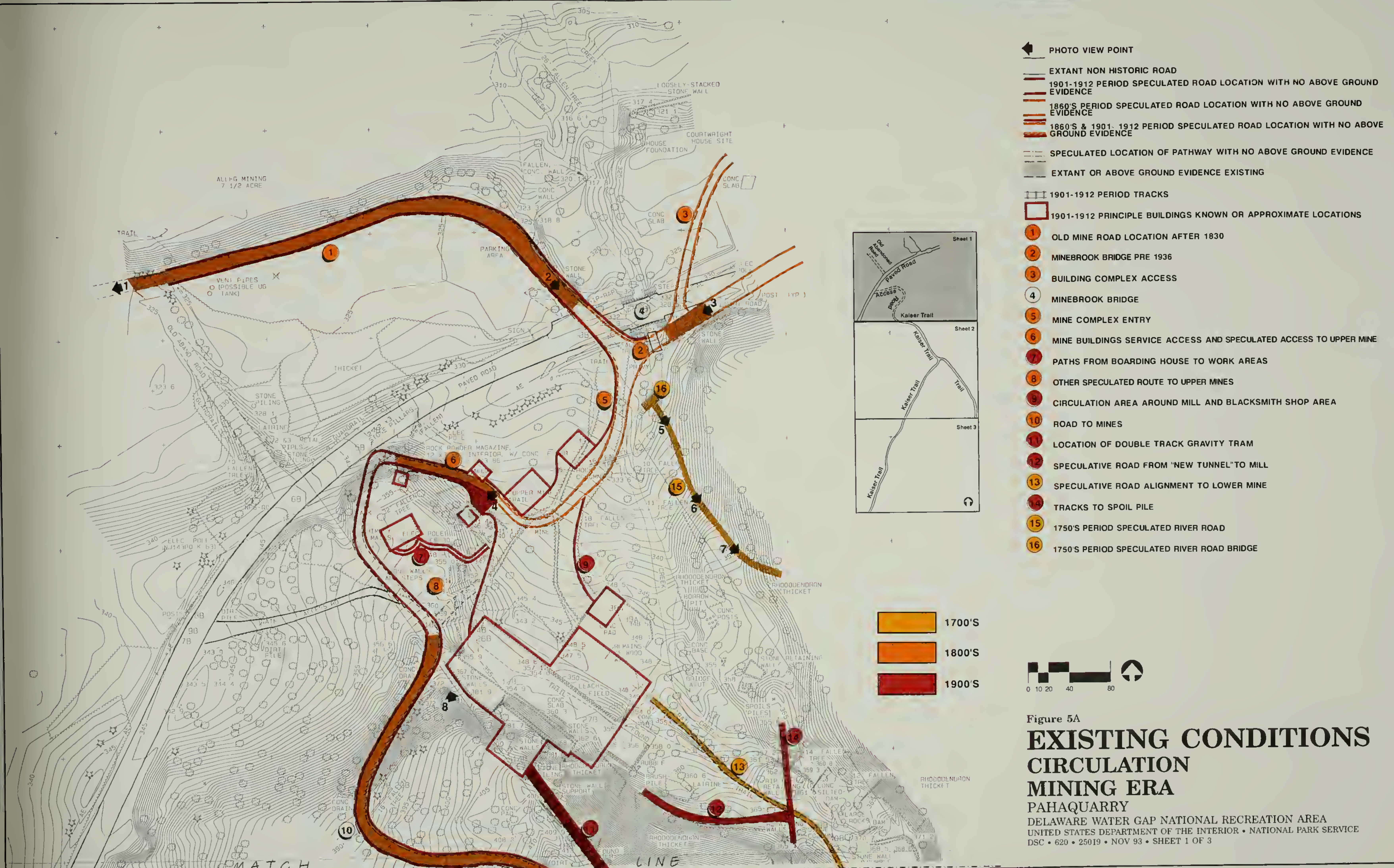

Figure 5A

EXISTING CONDITIONS
CIRCULATION
MINING ERA

PAHAQUARRY
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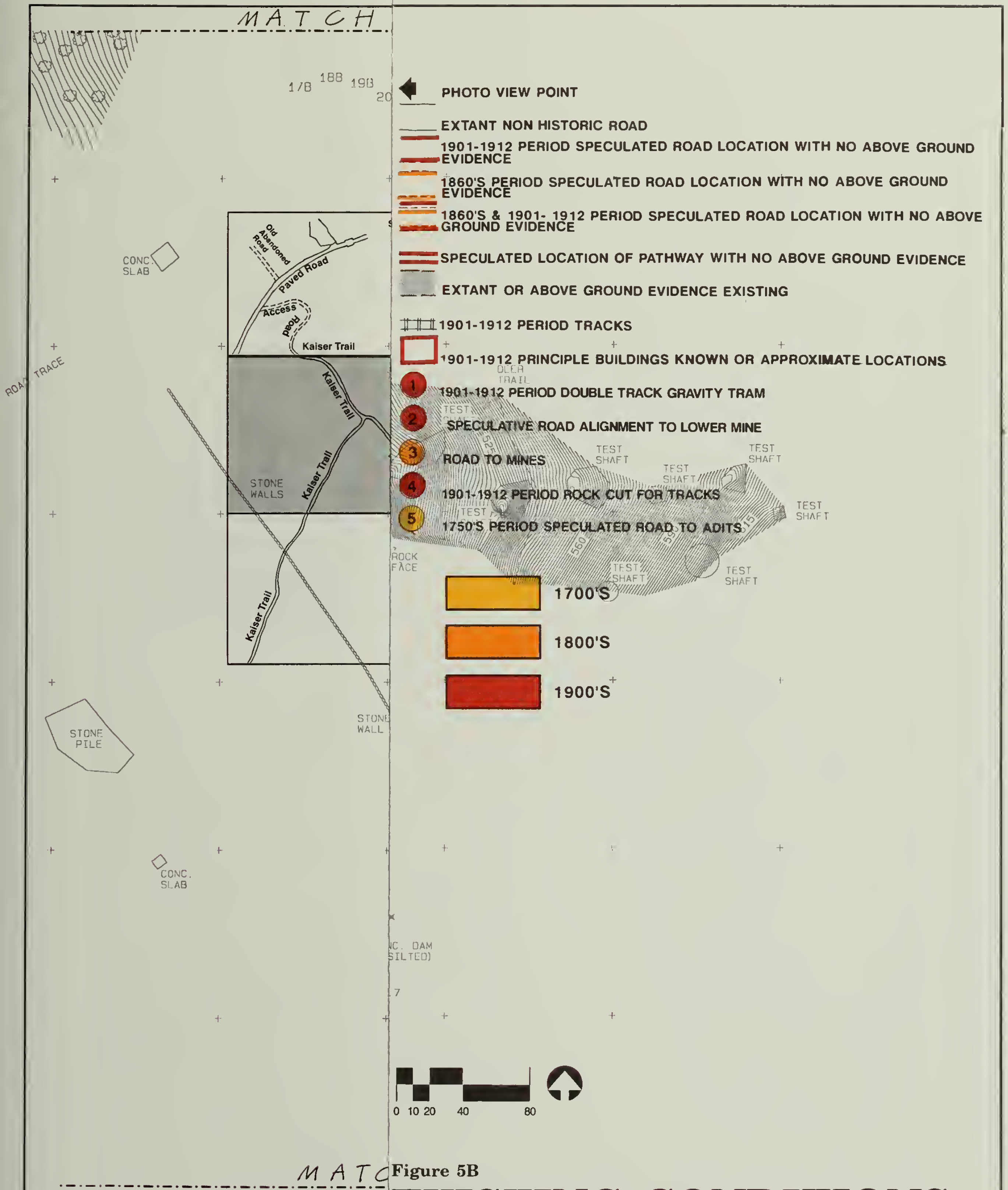

Figure 5B

EXISTING CONDITIONS
CIRCULATION
MINING ERA

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Figure 5B

EXISTING CONDITIONS
CIRCULATION
MINING ERA
PAHAQUARRY

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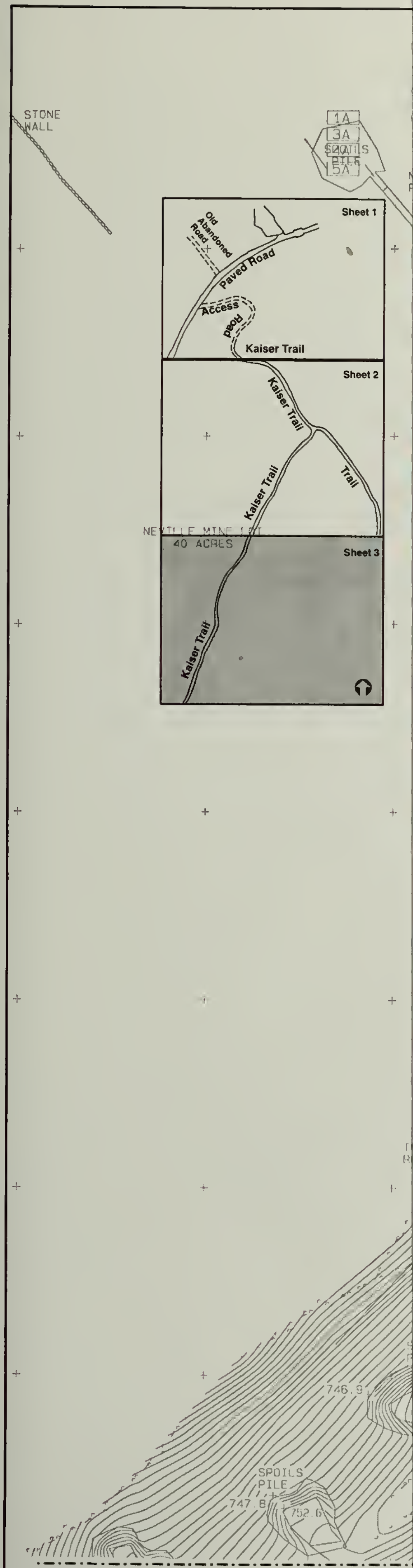

PHOTO VIEW POINT

EXTANT NON HISTORIC ROAD

1901-1912 PERIOD SPECULATED ROAD LOCATION WITH NO ABOVE GROUND EVIDENCE

1860'S PERIOD SPECULATED ROAD LOCATION WITH NO ABOVE GROUND EVIDENCE

1860'S & 1901- 1912 PERIOD SPECULATED ROAD LOCATION WITH NO ABOVE GROUND EVIDENCE

SPECULATED LOCATION OF PATHWAY WITH NO ABOVE GROUND EVIDENCE

EXTANT OR ABOVE GROUND EVIDENCE EXISTING

1901-1912 PERIOD TRACKS

1901-1912 PRINCIPLE BUILDINGS KNOWN OR APPROXIMATE LOCATIONS

1 SPECULATIVE LOCATION OF DOUBLE TRACK GRAVITY TRAM

2 SPECULATIVE LOCATION OF TRACKS FOR SPOIL PILE

3 ROAD TO UPPER MINE

4 PRE 1901 ROAD REMNANT

1800'S

1900'S

0 10 20 40 80

Figure 5C

EXISTING CONDITIONS
CIRCULATION
MINING ERA

PAHAQUARRY

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Figure 5C

EXISTING CONDITIONS

CIRCULATION

MINING ERA

PAHAQUARRY

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PHOTO VIEW POINT

HISTORIC ROAD UNKNOWN IF EXTANT

EXISTING ROAD PAVED

EXISTING ROAD TRACE UNPAVED

1830-1936 OLD MINE ROAD ALIGNMENT

1830S TOWNSHIP ROAD

1830S TOWNSHIP ROAD

LOCAL ROAD APPEARING ON 1860 WALLING
AND 1874 BEERS MAPS

TE: THE COPPER MINE TRAIL FROM THE MOUTH OF MINEBROOK TO THE UPPER MINE TUNNELS AND ACROSS MINEBROOK APPEARS TO FOLLOW THE 1845 ROAD SHOWN ON THE CAMDEN COUNTY HISTORICAL SOCIETY MAP. THE ROAD FROM THE COPPER MINE INN TO THE APPALACHIAN TRAIL TO CAT FISH POND ALSO APPEARS TO FOLLOW THE ROAD SHOWING ON THIS 1845 MAP. IF THEY ARE EXACTLY THE SAME ROADS CANNOT BE CONFIRMED AT THIS TIME.

Figure 5D

EXISTING CONDITIONS
CIRCULATION
MINING ERA

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Figure 5D

EXISTING CONDITIONS
CIRCULATION
MINING ERA

PAHAQUARRY

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Figure 5A Photo 3
Post 1830 old mine road alignment and retaining wall

Figure 5A Photo 4
Remains of 1906 mine road overgrown with vegetation

Figure 5A Photo 5
Pre 1830 road alignment

Figure 5A Photo 6
Pre 1830 road alignment

Figure 5A Photo 7
Pre 1830 road alignment

Figure 5A Photo 8
Possible 1908-1912 access from the mill to the ore bin later used by the Boy Scouts

Figure 5B Photo 1
1847 mine road to upper workings used again in 1900s mining

Figure 5B Photo 2
1908 grade bed of tramway

Figure 5B Photo 3
1847 mine road to upper workings used again in 1900s mining

Figure 5B Photo 4
1908 tramway grade through "cut"

Figure 5B Photo 5
1908 tramway grade through "cut"

Figure 5B Photo 6
Probable 1750s access road to adit number 2 and inclines

Figure 5B Photo 7
Colonial era path along Mine Brook to lower mine adit
Stone work of leveled pad left

Figure 5B Photo 8
Colonial era path along Mine Brook to lower mine adit

Figure 5B Photo 9
Road to Upper Colonial mine adit looking north

Figure 5B Photo 10
Road from Upper Colonial mine adit looking south

Figure 5C Photo 1
1847 road to upper workings later used in 1900s mining activity

Figure 5C Photo 2
1847 road to upper workings later used in 1900s mining activity

Figure 5C Photo 3
Possible 1847 road trace

Figure 5D Photo 1
1854 township road from Copper Mine Inn

Figure 5D Photo 2
1854 township road from Copper Mine Inn

Figure 5D Photo 3
1854 township road from Copper Mine Inn stonework

Figure 5D Photo 4
1854 township road from Copper Mine Inn

Figure 5D Photo 5
1854 township road from Copper Mine Inn

Figure 5D Photo 6
1854 township road from Copper Mine Inn

Figure 5D Photo 7
1854 township road from Copper Mine Inn

Figure 5D Photo 8
1854 township road from Copper Mine Inn foundation remains along road

Figure 5D Photo 9
1854 township road from Copper Mine Inn foundation remains along road

Figure 5D Photo 10
View of post 1830 Old Mine Road alignment

BUILDINGS AND STRUCTURES

Over the three centuries of mining and occupational use of the site, many buildings and structures have been constructed, reused, and torn down. Today, only one building from the 1901-1912 mining period remains on the site. Ruins exist from a number of buildings and structures from the mining periods and Boy Scout periods, and are discussed here in that order. The discussion corresponds with Figures 6A, 6B, 6C, and 6D for the mining period and Figure 6E for the Boy Scout period.

MINING ERAS

1750s Period Buildings

It is known that a number of buildings existed that were associated with mining and occupation of the site in the 1750s near Mine Brook on the previously mentioned two-acre lot purchased in 1754. These included workers' housing, a residence, which undoubtedly would have had associated outbuildings, and a mill. The mill was located along Mine Brook below the lower mine tunnel and believed to have been located as shown on Figure 6A, number 26.

None of the residential buildings have survived, however, they may exist as archeological sites. The 1753-1912 Property Ownership Map shows the two-acre lot believed to be the location of this residential development.

Mill remains must have existed in 1862 since they are mentioned in Dickeson's 1862 report as the former site of a mill. The mill site is perhaps at least partially buried under the spoil piles from the "new tunnel" of 1901. The location of the mill as identified above is based on the location of the lower 1750s dam and mill race and the general topographic configuration of the area. No clear above ground evidence of the mill exists. Archeological evidence may exist, however, for this mill.

1750s Period Structures

Two dams existed to supply water through the mill race as power for the mill. "The second dam" was located "a short distance" below the lower mine adit. These dams and possibly the mill race have been located and are identified on Figures 6A and 6B, numbers 25, 2, and 15 respectively. These dams are constructed of well fitted substantial size dry-laid stone.

The lower dam is the most intact and the area behind the dam was obviously the pond which is now leveled with silt. This level silted area behind the dam was later adapted by the Boy Scouts for their Order of the Arrow "ceremonial grounds". The tail race used to power the mill is probably the trench-like land form identified as number 25 on Figure 6A. This location is in a logical location for a race as well as topographically appearing as a race remnant. This speculated alignment also leads to an area well suited for the mill site. The point where this race could have connected to the mill, however, has been obliterated

by the construction of the later spoil piles and a stone-lined channel of Mine Brook as well as a concrete Boy Scout dam.

The upper colonial dam located "a short distance" below adit number one, has been breached through the center. This dam shows the same type of construction as the lower colonial dam. Less of the fitted dry laid stone work is visible on this dam.

Both dams have suffered the ravages of time and their original forms have been obviously altered by erosion, silting, and vegetation growth. A clearly identified threat to these colonial features as with modern earthen dams is the growth of trees on the structures. The roots of the trees are pushing the stone walls apart and causing the dams to break apart.

Another apparently colonial era structure in this area is the bridge abutments located on Figure 6A, number 28. Since the original Old Mine Road prior to 1830 was located higher than the post 1830 alignment, these extant bridge and road alignment remnants likely date from this period. Only the remnant road alignment and some obviously placed and fitted stones indicate the location of this bridge. The later Boy Scout period bridge remains that exist here, however, are differentiated by concrete mortar construction. The earlier dry laid stone work appears to be continuously deteriorating from vegetation growth as well as erosion.

Very impressive structures from this period, which are dramatic evidence of the colonial mining explorations, are the adits and tailing piles. Figure 6B numbers 4, 5, 6, 9, 10, 11, 12, 15, and 17, and Figure 6D, number 3 identify these tunnels, exploratory adits, inclines, and spoil piles. The lower and upper tunnels and incline shaft number 4 are the subject of a detailed stabilization study concurrently being done by the Bureau of Mines. The condition of these features are addressed in that study attached here as Appendix H.

The smaller exploratory shafts and workings on Figure 6B, numbers 12 and 17 have been filled with debris but are clearly evident. The long trench workings, number 11 in Figure 6B, are eroded and causing significant problems with the stability of the portal of the upper mine adit number 2. The substantial tailings (Figure 6B, number 5), associated with the workings shown on Figure 6B, number 6, 9, 10, 11, 12, and 17, and Figure 6D, number 3, are plainly evident although after many years, the forest has gradually grown over this feature.

Buildings of the 1847-1848 and 1861-1862 Periods

Several buildings associated with the 1847-48 mining period are thought to have existed on the river terrace on the east side of Mine Brook as shown in Figure 6A, numbers 1, 3. Structures are shown in this location on the Dickeson 1862 sketch and the Beers 1874 map (Illustration 8 and 22). These buildings are believed to be the structures built in 1847 by the Alleghany Mining company. A conflict arises, however, in the description of the buildings that occupied this location. Oliver Courtright, who bought the property in 1875, had a house on this site. It appears in Historic Photo 6 dated Ca. 1910 and in Appendix I. Consequently, one could conclude that the Courtright house and the 1847 mine house are the same building. This is especially logical since the Courtright building, that is

visible in the 1910 photograph, appears to be old. If one concludes that the building in the 1910 photograph is part of the same house and barn complex from 1847, there is a conflict because the description of the house in this location, which Courtright occupied, did not have a basement. This does not match with the description of the mining building which had a six-foot basement. Despite the conflicting descriptions, one must conclude that the Courtright house and the 1847 mine house are the same building based upon the Dickeson 1862 sketch and the Beers 1874 map.

Other buildings known to have existed during this 1861-1862 mining period were associated directly with the ore extraction at "tunnel number 5" shown on the 1862 Dickeson drawing and identified on Figure 5C, number 2. Dickeson's 1862 report identified a "shed" and an "ore house" which had been constructed. No above ground evidence of these buildings exist today. No other buildings have been documented from this period of mining activity.

1847-1848 and 1861-1862 Structures

Numerous structures have been identified from this period of speculative mining exploration. These include remains of the stone walls from the post-1830 Old Mine Road (Figure 6A, number 29 and 30, and figure 6D, number 4) and extensive exploratory shafts (Figure 6C, numbers 2, 4-10, 13, and 14 shown in photos 6C, numbers 18-30). The 1750s adit number 1 was also extended about fifty feet during the 1847-1848 period where the first turn is made to the northwest. This is the only effort which appears to have re-explored the earlier colonial explorations. The nature of these 1800s exploratory shafts is evidence of what appears to be a more speculative and less extensive exploration of copper than perhaps the earlier and later efforts. One unique feature which has also been identified as being likely from this period is a privy site shown on Figure 6A, number 27 and shown in photo 24.

The stone walls associated with Old Mine Road during this period range from very good condition to completely collapsed. The completely collapsed section of wall is located on Figure 6D, number 4, photo 15. This was probably due to erosion of the bank by the river. This erosion in addition to vegetation growth is the greatest threat to the preservation of these features.

The privy feature is speculated to be from this period because it is round and dry laid stone which is different from the type of construction of the later mining and Boy Scout period. This feature is evident as a round depression with some of the stone work exposed. It is completely filled.

Except for the small extension of the 1700s period adit number 1 mentioned above, the work of the 1800s seems to be concentrated in a series of cross cuts and shafts above the latter 1900s quarry site. Only shafts number 11, 12, 13, and 14 as identified by Dickeson in his 1862 report, have been disturbed by the later workings of the 1900s. Numbers 11 and 12 appear to have been taken out by the open quarry mining and number 14, as Dickeson described its location, appears to be under a spoil pile. This would explain why these three adits were not found during the field investigations of the site. Cross cut number 13, photos 27, 28, and 29, is described by Dickeson as a seventy-five foot trench.

This trench was either extended in the 1900s efforts or, more likely, it was extended to its current 260 feet soon after Dickeson completed his report. Other cross cuts Figure 6C numbers 9, 10, and 14, and photos 25, 26, and 30 are not identified in Dickeson's report and were also either constructed after his report during this same period of exploration or later during the 1900s.

All of the shafts and trenches from this 1800s period are stable, although they are being slowly filled with forest duff and vegetation is growing in some these features. The trenches especially are filling with vegetation.

1901-1912 Period Buildings

An entire complex of buildings was constructed during this period of mining representing the commitment to the effort undertaken and the technology and nature of the copper mining industry of that time.

The core of the complex is shown in Figure 6A. The buildings included: the mill shown as number 5, the boarding house with outhouse shown as number 7, a barn with an outhouse as number 12, an outbuilding shown as number 8, a powder house shown as number 9, an oil house shown as number 10, an ice house shown as number 11, an office and outbuilding shown as numbers 13 and 14, a pump house shown as number 15, a blacksmith shop shown as number 6, and an unknown building shown as number 4. On Figure 6C, another building, which was an ore tipple, is shown as number 1.

Condition of Extant Remains of 1901-1912 Period Buildings

Mill

Extensive evidence exists today of the mill ruins. Although parts of the mill were modified for use by the Boy Scouts, most of the existing remains are from the original mill. Figure 6A, photos number 2, 3, 4, 5, 25, 28, 29-34, and 36, show portions of the mill ruins.

The mill remains are composed primarily of the foundation walls, a number of interior and exterior walls, retaining walls, and floor slabs. Some of the walls are a poured-in-place concrete with most of the walls and foundations being a rough-cut, random size stone with full flush mortar joints. Overall, the walls appear to be stable, however, many sections are threatened from vegetation pushing sections of wall and weathering of mortar joints.

Boarding House

Figure 6A, number 8 shows the site of the building. The boarding house was modified by the Boy Scouts and the demolition of the building by the United States Army Corps of Engineers left little above ground ruins. The site is recognizable primarily as a depression which corresponds to the foundation and by the structural remains distributed around the site. The building site is being quickly obscured by vegetation.

Outbuilding

An outbuilding, apparently associated with the boarding house, existed to the northwest of the boarding house. No clear above ground evidence exists of this building although a

metal tank exists in the area that approximately corresponds to the location of this building. This area is shown in Figure 6A, number 10.

Storage House

Figure 6A, number 9 shows the existing building. This building is identified as the "powder house" based on the nature and construction of the building although no documentation has been uncovered to identify the building. This is the only extant building on the site. It is an earth sheltered building which measures 12x7x8 feet on the interior and is constructed with two-foot thick rough-cut, random size stone walls. The mortar joints are fully flush and raked. Only the front elevation of the building with the door opening is exposed. The rest of the building is earth sheltered. The roof is domed and appears to be constructed of brick and faced with concrete. The floor is also concrete.

The building appears to be stable although some of the stones in the face are falling, and moisture and plant growth in the walls are threatening the building's integrity. Cracks are also appearing along the mortar joints.

Oil House

Figure 6A, number 10 shows the existing remains of this building. The oil house was enlarged in the Boy Scout period and used as a trading post. The remains exist as wall ruins both standing and fallen which can be distinguished as the original oil house and the later addition for the conversion to a trading post. The above ground wall ruins are constructed of rough-cut, random size stone with fully flush mortar.

The ruins are almost completely overgrown with vegetation which is causing severe deterioration. Moisture and weathering of the mortar joints are also deteriorating the walls.

Blacksmith Shop

The foundation of the blacksmith shop was apparently incorporated into the foundation of the second mess hall constructed by the Boy Scouts as shown in Figure 6A, number 6. The northwest and northeast foundation walls of the Boy Scout mess hall are constructed of a rough-cut, random size stone with fully flush mortar similar to the construction of the other buildings in the mine complex. This portion of the foundation presents a distinct difference to the remaining mess hall foundation which has been built of concrete block, a common Boy Scout era construction method. The size and location of the stone foundation wall also corresponds with the size and location of the blacksmith shop. It is likely that the other two walls of the building are extant under the slab of the Boy Scout building. There is also a scattering of slag on the ground around the area of this foundation.

The stone foundation walls of the blacksmith shop appear to be in stable condition. Probably because it was incorporated into the mess hall, with a concrete slab which still exists over the walls, these walls were better preserved than some others in the complex.

Tipple

Shown on Figure 6C, number 1, the tipple building was constructed of wood and is now evident as a depression, scattered log beams, loose ore, and an ore scoop. The above-ground timber building ruins are quickly deteriorating. A photo taken of the building in

Ca. 1960s, Historic Photo number 36, and photos taken recently, Figure 6C, photos 1-5, illustrates this deterioration.

Building of Unknown Use

This building whose purpose during this period is not documented was later converted for use by the Boy Scouts as a cook's house. This fact in addition to the scale of the building indicates that it may have been a residence, perhaps, for the mine engineer or a higher paid employee who would not have lived in the boarding house. Fireplace or chimney remains of the building, which were apparently incorporated by the scouts into a bar-b-que are shown in Figure 6A, photo 4. The outline and depression of the building as well as foundation remains are evident. Building remains are also scattered throughout the area.

1901-1912 Period Structures

In addition to buildings and circulation systems which existed as part of the mining development during this period, a large number of structures were constructed and exist throughout the site.

These structures include three dams which supplied water for the mill shown on Figure 6A, numbers 16 and 18; Figure 6B, number 8; and the water line from the upper dam shown on Figure 6B, number 2.

Pilings, footings, and track foundations are evident from the double track gravity tram used to bring the ore to the mill as identified on Figure 6A, number 24; Figure 6B, numbers 1, 16, and 3 as well as the massive "cut" and spoil piles from this tram shown on Figure 6B, numbers 7 and 13, and Figure 6C, number 3.

The sites of the actual mining explorations contain impressive structures. These include the caved portal and dry laid stone walls of the "new tunnel" shown on Figure 6A, number 22, and the spoil pile and stone wall stream channel associated with this tunnel shown on Figure 6A, numbers 20 and 21.

The 1750s adit number 1 was extended again during this period around 1901 and the last forty or so feet to the southwest is from this effort. A small concrete pad probably for locating a gas powered generator for this work is located just outside the portal as shown on Figure 6B, number 14. This is the only tunnel which shows the efforts of all three centuries of exploration.

The most impressive mining exploration structure from this period is the quarry site shown on Figure 6C, number 17 and its associated tailing piles shown on Figure 6C, numbers 16 and 18.

Small "cross-cut" exploratory efforts were also apparently made during this period. The original 1800s "cross-cut" (Figure 6C, number 13) could have been extended to its present length during this period. The cut shown on Figure 6C, number 14, which is not identified in Dickeson's 1862 report, was made during the earlier mining effort after Dickeson had written his report, or, later, during the 1900s period.

Historic Photo 36: Remains of the Tipple Ca. 1960s
Courtesy of Don Pace, Easton, Pennsylvania

Another shaft with associated building, roads, and track development, shown in the Historic Photographs numbers 37 and 38, was never located on the site. Since such extensive development would have left evidence visible today and an extensive effort to locate them could find no evidence, it is believed that either these photographs are not from the Pahaquarry mine, or this site is located somewhere outside of the historic core covered during the field investigations.

Condition of Extant Remains of 1901-1912 Period Structures

Upper Stone Dam

This first dam constructed to supply water to the mill around 1903-1904 is shown in Figure 6B, number 8. This dam, as shown, was later rebuilt by Boy Scout ranger Leonard Rue, Sr., who constructed a concrete dam on top of it. This concrete construction was probably done because it had silted. The dam has again completely silted. The original stone mining era dam has begun to break apart in some places. This situation may be due to both the additional load of the Boy Scout dam above and the pressure from silting behind both dams. Much of the stone face on the downstream side of the dam has moss and vegetation growing completely over it.

Lower Concrete Dam

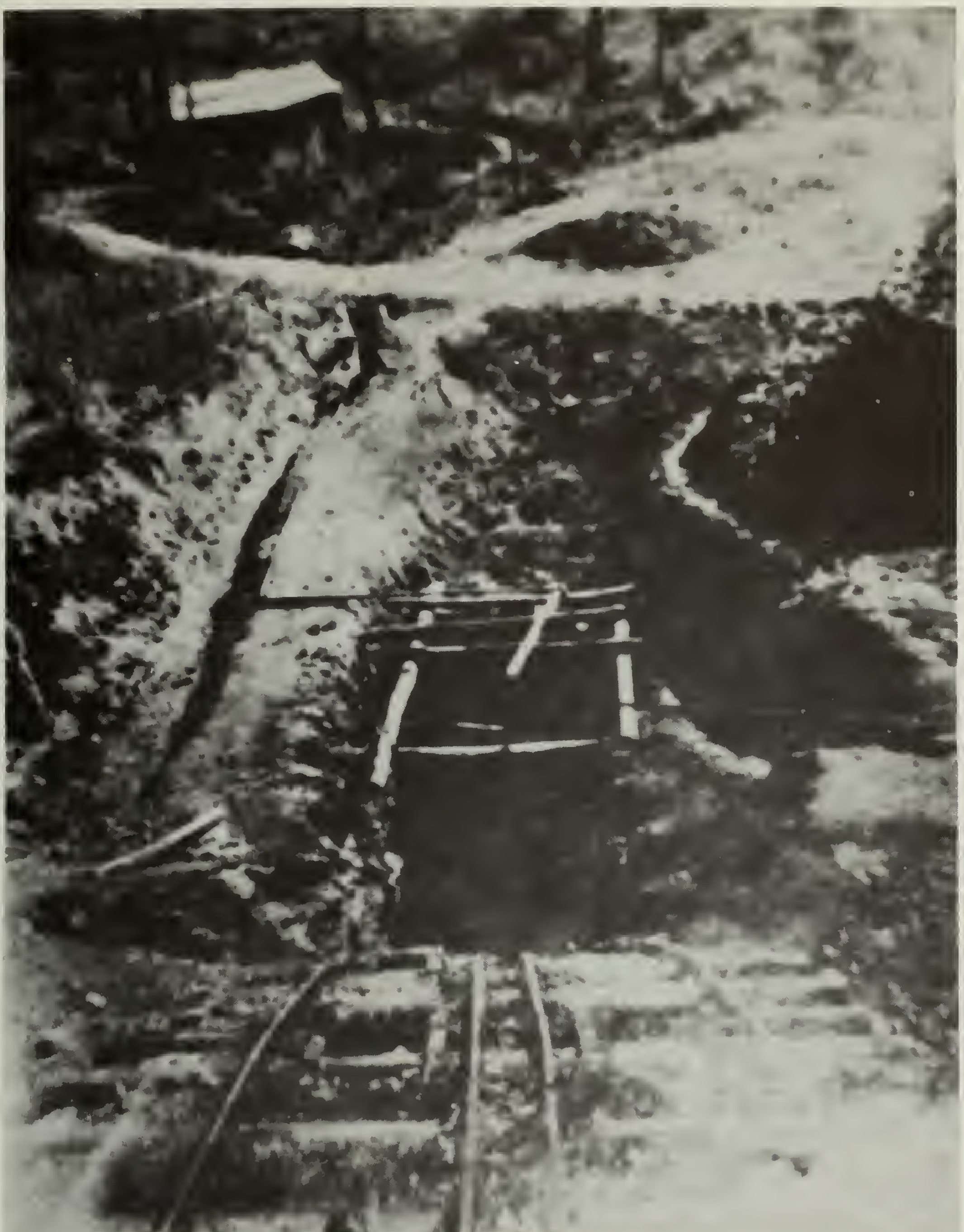
This lower dam was constructed around 1909 to supply the increased demand for water associated with the new flotation process of the mill. Much of the dam is intact as shown in Figure 6A, number 16. Its early concrete style construction is evident in the photos showing the size and texture of the aggregate used. The dam was apparently constructed with earth berming behind it and may have including some timber cribbing for support. Figure 6A, number 15, shows an in situ timber which appears to be part of this original dam construction. Figure 6A, number 14, is another similar timber but appears to have been moved.

The dam has been breached in the center and on the east end which was apparently the spill way. The dam was apparently breached before it silted since this dam is not silted. In addition to the broken sections of concrete from the dam, large cracks also exist. Vegetation and especially trees growing in the dam cracks, threaten to further deteriorate this feature.

Log Dam

The remains of a small log dam probably associated with the downstream concrete dam is shown in Figure 6A, number 18. This dam is indicated as an "old log dam" on the 1936 construction drawings for the re-alignment of Old Mine Road (Illustration 23). This dam may have served as a kind of catchment dam to prevent silting and debris from entering in the main dam reservoir. As seen in the photo only the bottom timber remains in situ. This dam is identified for removal in the 1936 construction work for Old Mine Road and must have been removed at that time.

Historic Photo 37: View of Mining Shaft and Tracks Purported to be at Pahaquarry, but the Site Never Found
Courtesy of Keith Deshler, Belvidere, New Jersey



Historic Photo 38: View of Mining Shaft and Tracks Purported to be at Pahaquarry, but the Site Never Found
Courtesy of Keith Deshler, Belvidere, New Jersey

Six-Inch Water Line

The first upper stone dam supplied water to the mill through a six-inch steel pipe which is still in situ for much of its original distance. Figures 6A, 6B, and 6C identify where the remains of this pipe are still visible or have been uncovered by erosion. The exposed sections of the pipe are rusted and severely corroded in some sections. The buried sections of pipe are likely severely corroded as well.

Gravity Tram Foundations and Footings

A number of the small foundations and footing remains for the gravity track tram exist along what was the lower portion of this track as it approached the ore bin above the mill. These are shown in Figure 6A, number 24. Some of these footings which supported a trestle for the track as it came into the ore bin are completely intact and in situ. Others have fallen down the slope or are deteriorated. Located farther up the grade of the incline tram, identified on Figure 6B, number 1, are what appear to be a foundation which may have been the beginning point of the trestle and end of on-grade tracks. This appears as a rectangular pile of loosely laid stone. It has been covered with accumulated layers of leaves, but appears to be undisturbed.

Still farther uphill are more footings identified on Figure 6B, number 16. These footings are small loosely laid piles of stones about ten feet apart. Some of these have probably been removed. The area has been covered with many years of leaf deposit.

The last of the remaining track foundations are just below "the cut" identified on Figure 5B, number 3. This series of foundations are rectangular piles of loose laid stones which supported the tracks on this very steep section of grade. For the most part this series of foundations appears undisturbed.

The "Cut"

This structure is an impressive cut in the solid rock which accommodated the alignment and grade of the track for the tramway. It is about twenty-five feet wide and 350 feet long. It varies in depth from three feet to about twelve feet. Trees are currently growing on the track alignment. The entire structure, excavated from solid rock, appears to be very stable. Spoil piles from this cut are shown on Figures 6B, number 13. These impressive features clearly indicate the massive undertaking of this effort and amount of material moved to construct this tram. Because these spoil piles are more recent than those of the 1700s mining efforts, they are more clearly visible and have less deposition.

"New Tunnel"

This early 1901-1903 effort of the Pahaquarry mining company is a 300-foot-long-tunnel. The portal which was reinforced with wood timber and dry-laid stone retaining walls on the sides, has completely collapsed. This probably occurred as the roofing timbers rotted. The caved-in portal and the stone retaining walls are clearly evident as shown in Figure 6A, number 22. The stone retaining walls appear to be stable, however, vegetation growth between the stones is slowly breaking up the walls.

"New Tunnel," Tailing Piles, and Stone Channel

Waste rock from the new tunnel was taken by ore buckets on tracks and dumped directly outside the opening. A stone channel was apparently constructed to keep the spoil pile from damming Mine Brook. The spoil piles are shown in Figures 6A, number 20, and appear to be very stable. The dry-laid stone retaining wall constructed to channel Mine Brook has collapsed in several sections. It is shown in Figures 6A, number 21. Trees are growing in the tailing pile and breaking apart the walls. In addition erosion from the stream is possibly threatening this feature.

Quarry Site

The site of the open pit quarry, where the geological seam of ore outcrops, is a massive feature worked between 1906 and 1912. It measures 600 to 700 feet long, forty to eighty feet wide, and twenty to forty feet deep. Various geological reports describe this as the "watershed" and indicate the working of this sandstone ledge to be 2,000 feet along the strike. The site is shown in Figure 6C, number 17. A significant amount of rock was taken from the quarry on tracks to the tipple and then to the mill via the double-track gravity tram. A few of the drill holes for blasting the rock still exist and are shown in Figure 6A, photo 14. This feature appears to be stable although vegetation, especially trees growing in the rock, will continue to break up the rock. The floor of the quarry where the tracks were located is also rapidly filling with trees.

Quarry Tailings

Massive waste tailing piles are evidence of the amount of material mined during this period as identified on Figure 6C, numbers 16 and 18. These tailings are like those identified from the cut for the tram and appear stable with vegetation slowly taking hold on their slopes.

RAILROAD TIE AND BARREL STAVE MILLING PERIOD 1920-1922

Some additional minor development occurred during this period. Logs were cut from above Mine Brook across from the lower mine tunnel and rolled over the slope to the area along that stream that later became the Boy Scout Order of the Arrow site. A rail line ran from this site to the mill. The exact location of this track is not known, however, the trace shown on Figure 5A, number 12 may be from this track. The lower part of the existing mill was adapted to serve as a sawmill where railroad ties were produced. Other existing development from the previous mining activity was probably also adapted for use such as the road, and possibly other buildings and structures. A small brick building was constructed near the old blacksmith shop. It is the only new building known to have been constructed. The foundation of this building is probably located under the concrete slab of the second Boy Scout mess hall. No other remains from this period are known to exist.

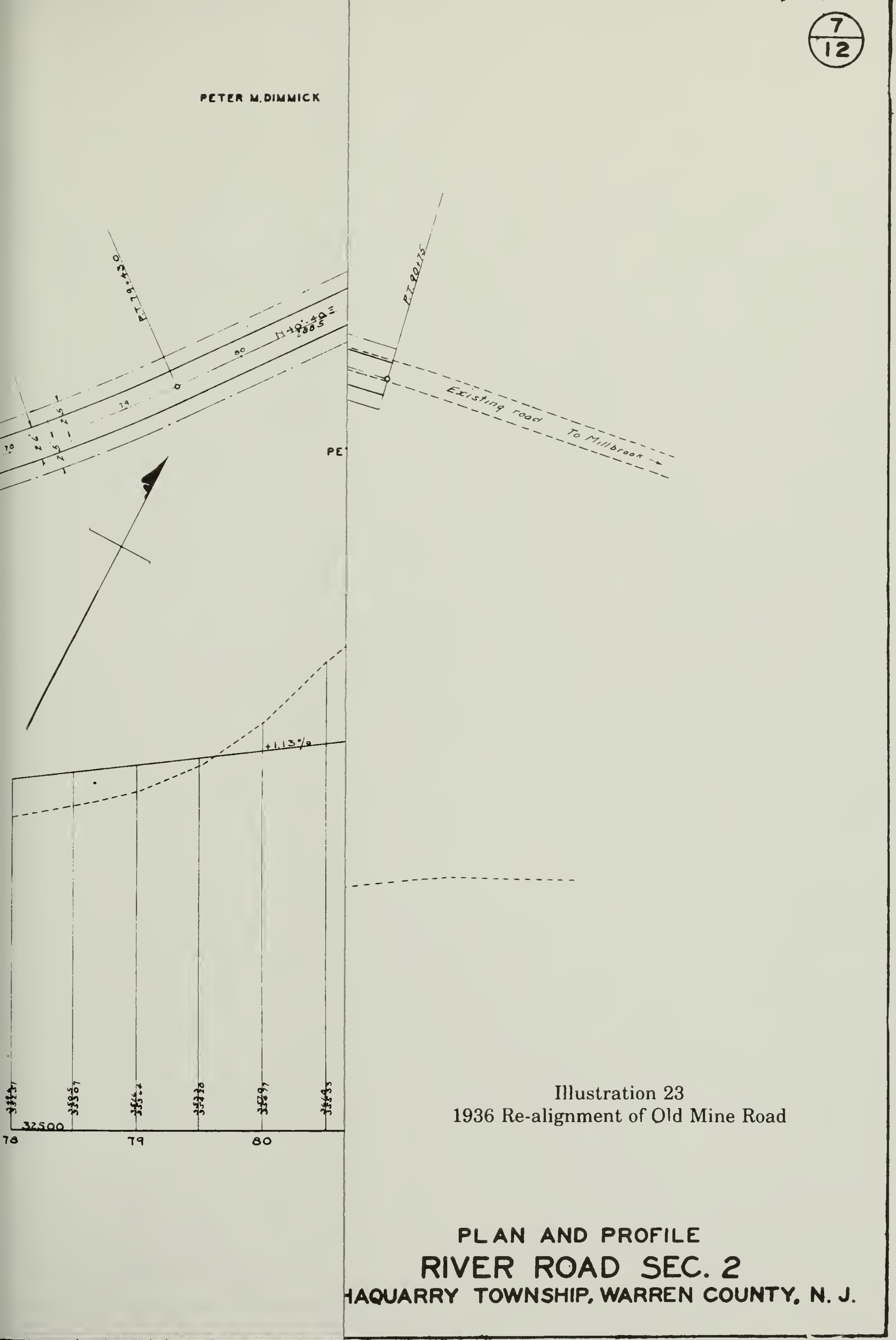


Illustration 23
1936 Re-alignment of Old Mine Road

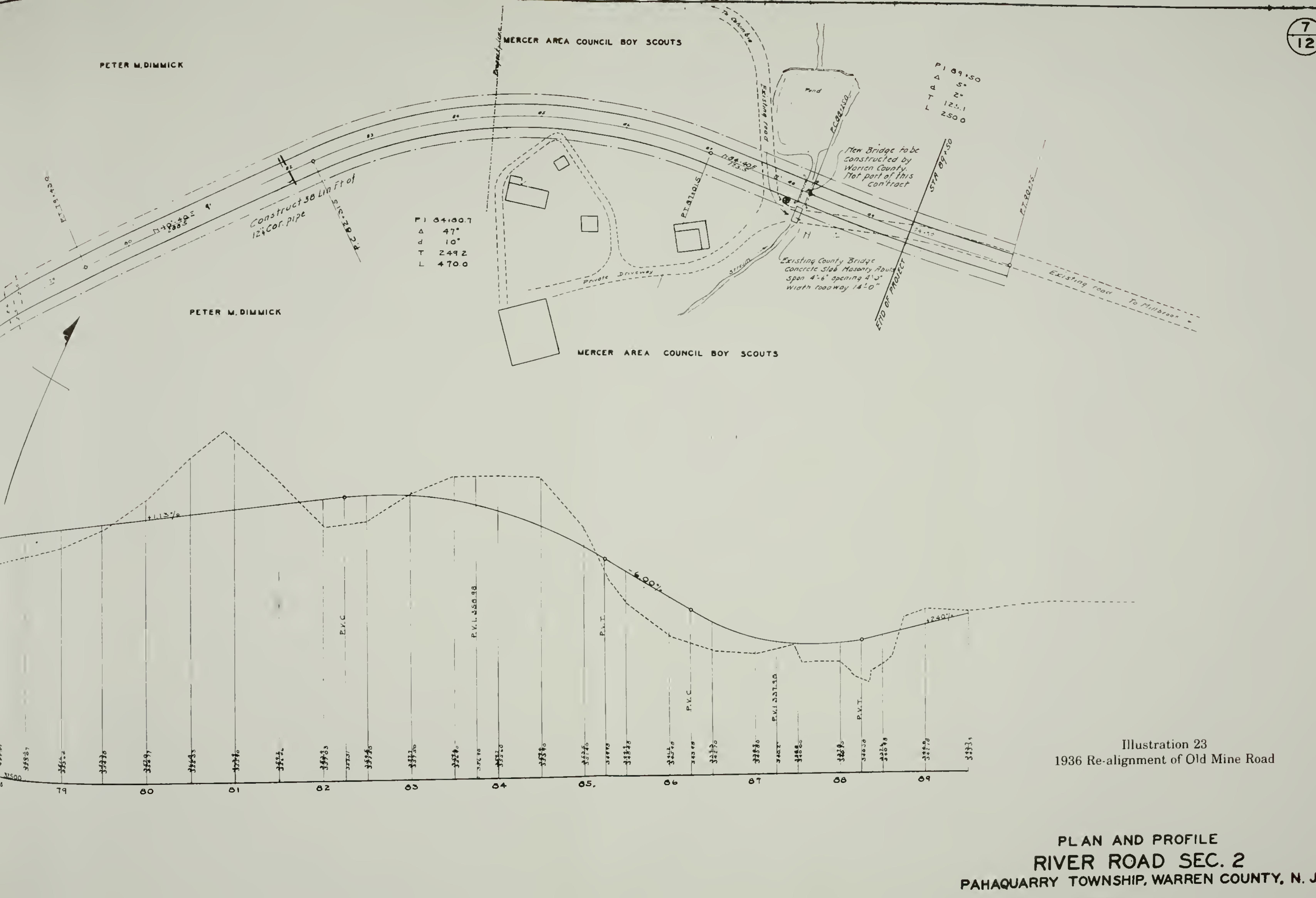


Illustration 23
1936 Re-alignment of Old Mine Road

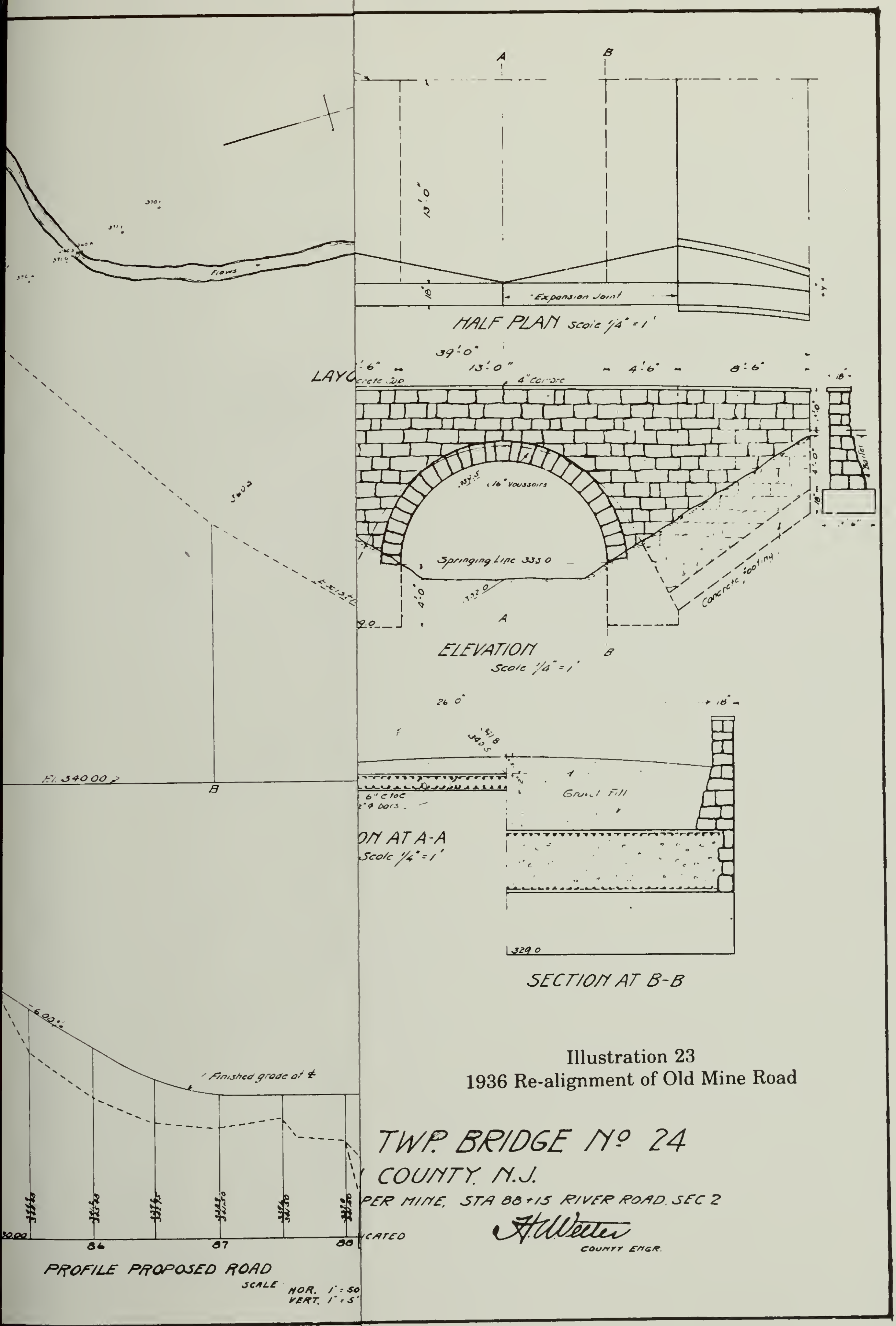


Illustration 23
1936 Re-alignment of Old Mine Road

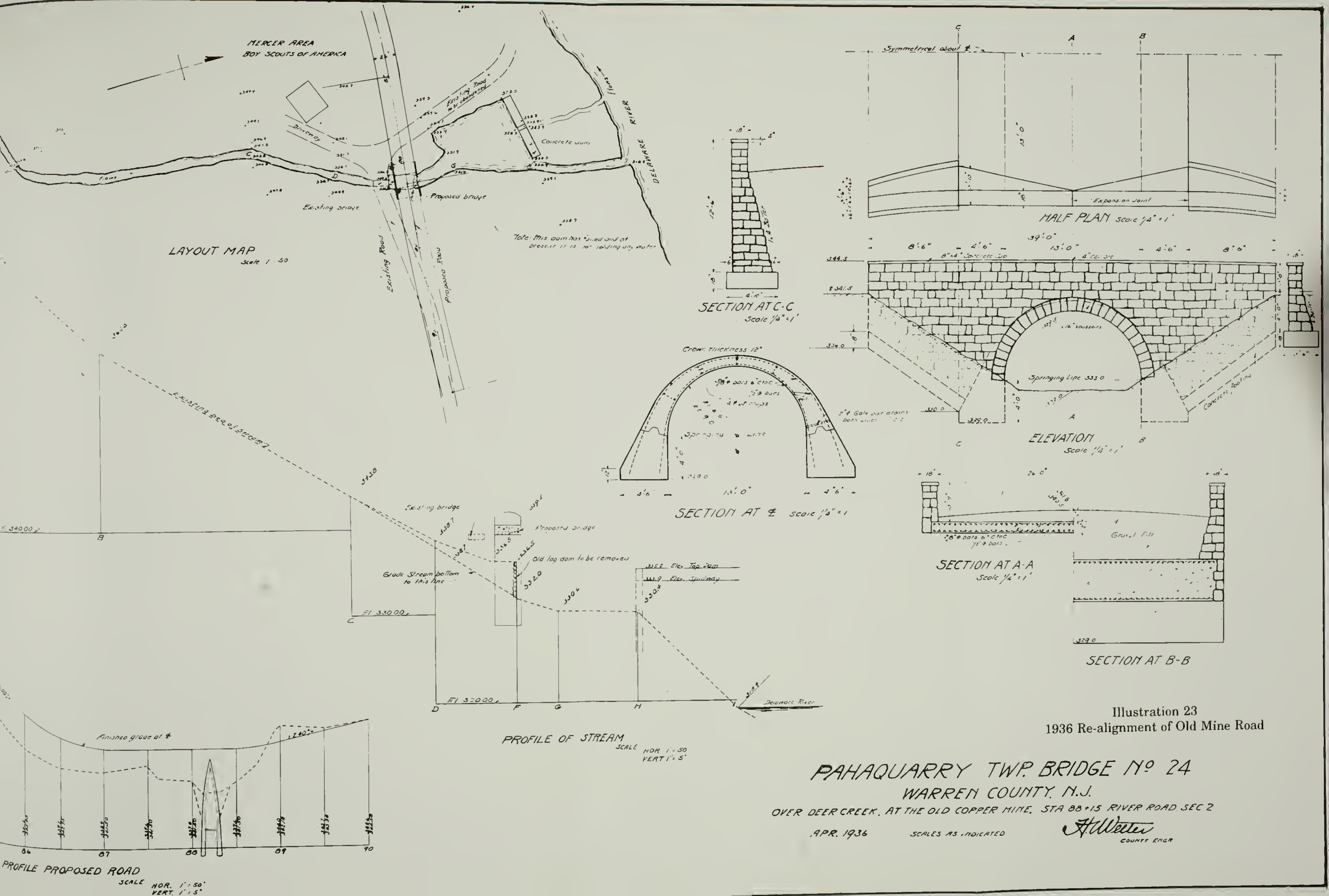
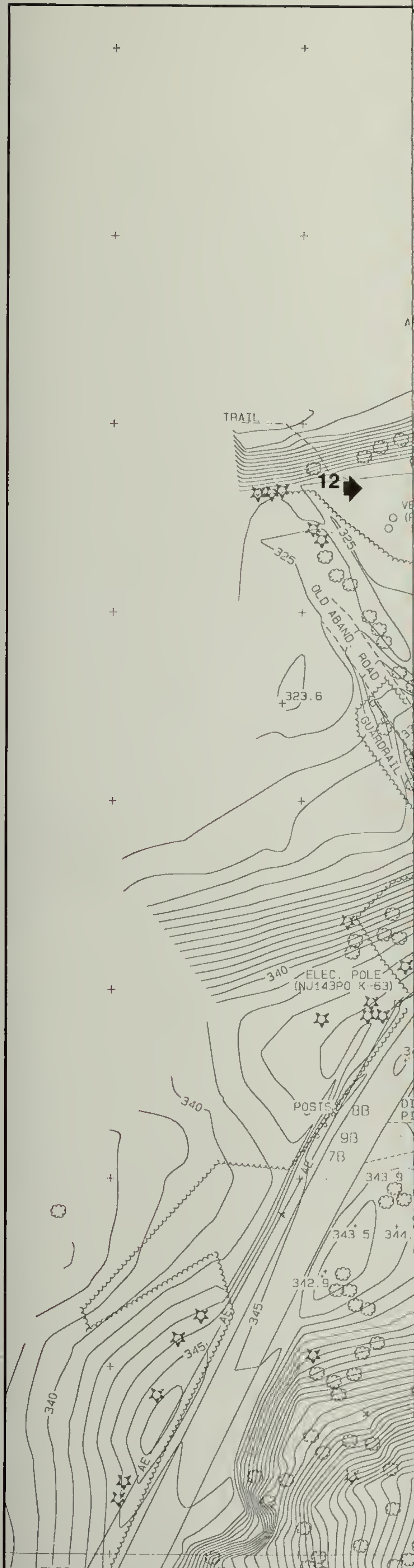


Illustration 23
1936 Re-alignment of Old Mine Road



RUINS ABOVE GROUND EVIDENCE OR EXTANT BUILDINGS OR STRUCTURES

ESTIMATED LOCATION OF BUILDING SITE W/NO ABOVE GROUND EVIDENCE EXISTING

PHOTO VIEW POINT

1 1847-1862 SPECULATED LOCATION OF MINE BUILDINGS AND 1860'S COURTWRIGHT HOUSE SITE
2 UNKNOWN PERIOD DRY LAID STONE WALLS AND RACE
3 STONE RETAINING WALL
4 1901-1912 PERIOD ESTIMATED LOCATION OF UNKNOWN BUILDING
5 1901-1912 PERIOD MILL
6 1901-1912 PERIOD BLACKSMITH SHOP
7 1901-1912 PERIOD BOARDING HOUSE
8 1901-1912 PERIOD UNKNOWN OUTBUILDING
9 1901-1912 PERIOD EXTANT EARTH SHELTERED BUILDING
10 1901-1912 PERIOD OIL HOUSE
11 1901-1912 PERIOD ICE HOUSE
12 1901-1912 PERIOD BARN
13 1901-1912 PERIOD OFFICE
14 1901-1912 PERIOD UNKNOWN OUTBUILDING
15 1901-1912 PERIOD PUMP HOUSE
16 1901-1912 PERIOD DAM
17 FENCE AROUND PASTURE ADJACENT TO OLD MINE ROAD
18 1901-1912 LOG DAM LOCATION AND OLD LOG DAM REMAINS
19 PRE 1936 BRIDGE
20 1901-1912 PERIOD SPOILS
21 1901-1912 PERIOD STONE CHANNEL
22 1901-1912 PERIOD NEW TUNNEL
23 1901-1912 PERIOD HITCHING POST & POLE
24 1901-1912 PERIOD PILINGS FOR TRAM
25 1750'S PERIOD DAM AND MILL RACE
26 1750'S SPECULATED MILL LOCATION
27 PRE 1900'S STONE LINED PRIVY SITE
28 PRE 1830'S OLD MINE ROAD BRIDGE
29 PRE 1936 OLD MINE ROAD STONE RETAINING WALL
30 PRE 1936 OLD MINE ROAD STONE RETAINING WALL

0 10 20 40 80

Figure 6A

EXISTING CONDITIONS
BUILDINGS/STRUCTURES
MINING ERA

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA
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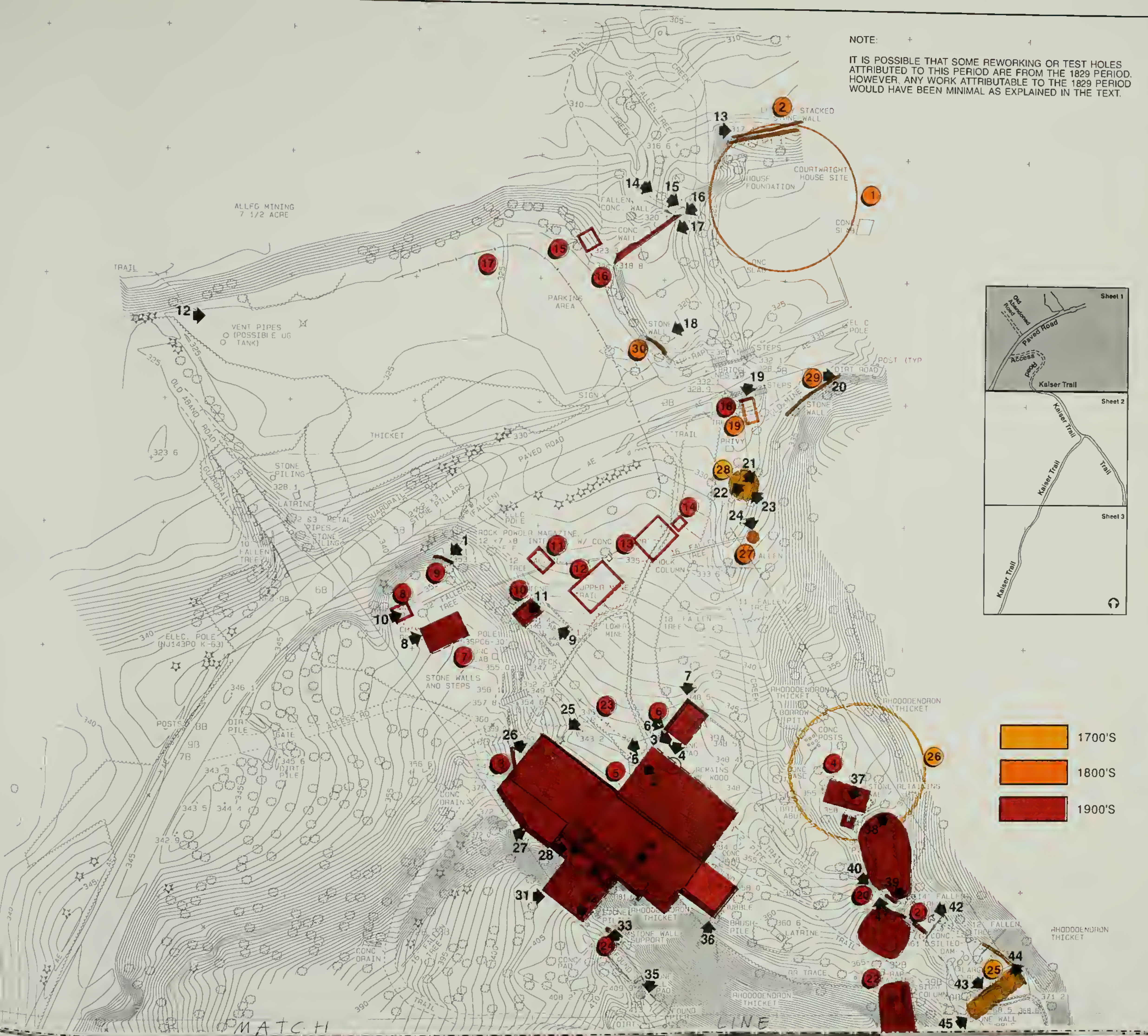
DSC • 620 • 25018 • NOV 93 • SHEET 1 OF 3

NOTE:

IT IS POSSIBLE THAT SOME REWORKING OR TEST HOLES ATTRIBUTED TO THIS PERIOD ARE FROM THE 1829 PERIOD. HOWEVER, ANY WORK ATTRIBUTABLE TO THE 1829 PERIOD WOULD HAVE BEEN MINIMAL AS EXPLAINED IN THE TEXT.



1700'S

1800'S

1900'S

RUINS ABOVE GROUND EVIDENCE OR EXTANT BUILDINGS OR STRUCTURES

ESTIMATED LOCATION OF BUILDING SITE W/NO ABOVE GROUND EVIDENCE EXISTING

PHOTO VIEW POINT

1 1847-1862 SPECULATED LOCATION OF MINE BUILDINGS AND 1860'S COURTWRIGHT HOUSE SITE
2 UNKNOWN PERIOD DRY LAID STONE WALLS AND RACE
3 STONE RETAINING WALL
4 1901-1912 PERIOD ESTIMATED LOCATION OF UNKNOWN BUILDING
5 1901-1912 PERIOD MILL
6 1901-1912 PERIOD BLACKSMITH SHOP
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12 1901-1912 PERIOD BARN
13 1901-1912 PERIOD OFFICE
14 1901-1912 PERIOD UNKNOWN OUTBUILDING
15 1901-1912 PERIOD PUMP HOUSE
16 1901-1912 PERIOD DAM
17 FENCE AROUND PASTURE ADJACENT TO OLD MINE ROAD
18 1901-1912 LOG DAM LOCATION AND OLD LOG DAM REMAINS
19 PRE 1936 BRIDGE
20 1901-1912 PERIOD SPOILS
21 1901-1912 PERIOD STONE CHANNEL
22 1901-1912 PERIOD NEW TUNNEL
23 1901-1912 PERIOD HITCHING POST & POLE
24 1901-1912 PERIOD PILINGS FOR TRAM
25 1750'S PERIOD DAM AND MILL RACE
26 1750'S SPECULATED MILL LOCATION
27 PRE 1900'S STONE LINED PRIVY SITE
28 PRE 1830'S OLD MINE ROAD BRIDGE
29 PRE 1936 OLD MINE ROAD STONE RETAINING WALL
30 PRE 1936 OLD MINE ROAD STONE RETAINING WALL

0 10 20 40 80

Figure 6A

EXISTING CONDITIONS
BUILDINGS/STRUCTURES
MINING ERA

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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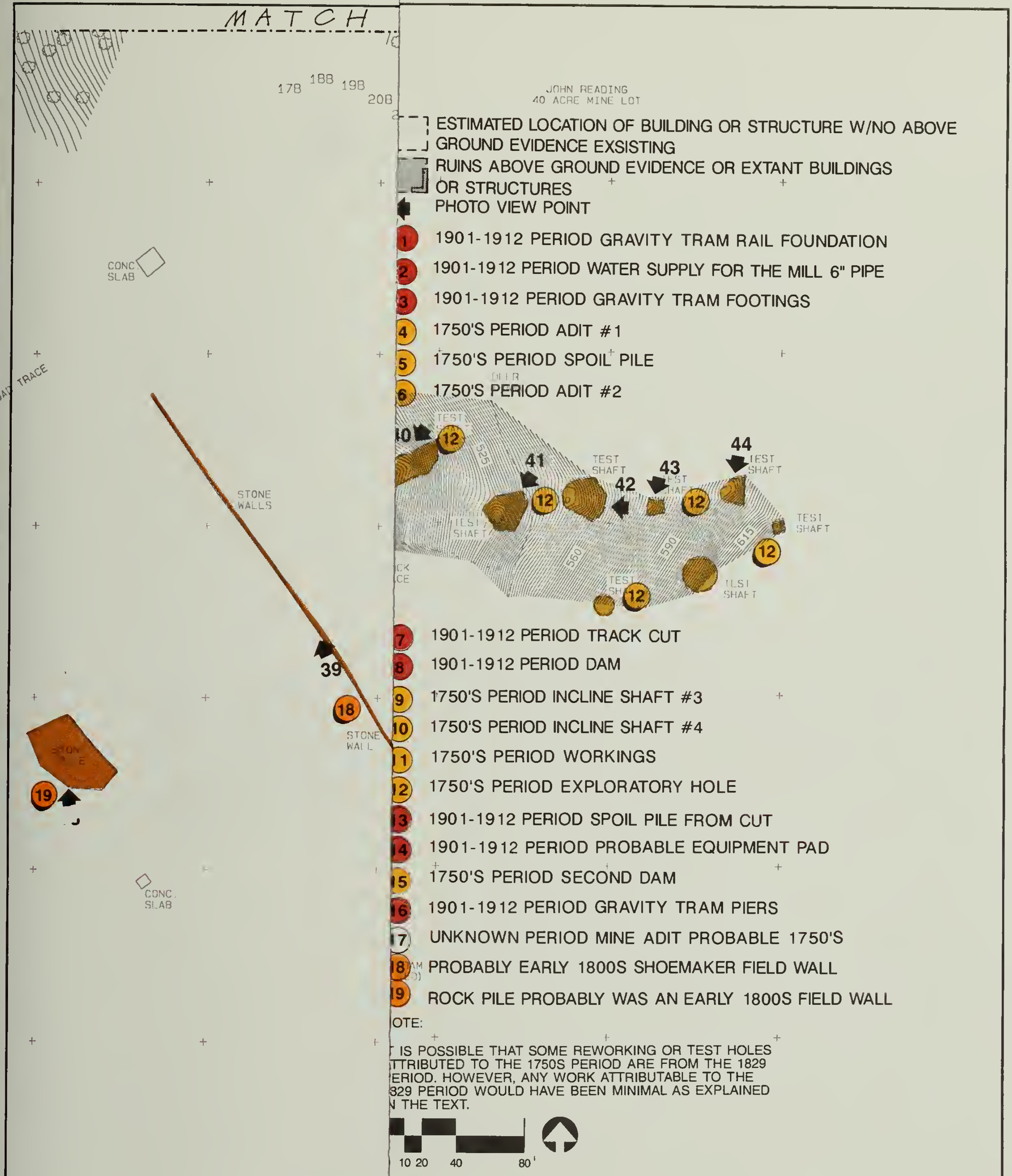

igure 6B

EXISTING CONDITIONS
BUILDINGS/STRUCTURES
MINING ERA

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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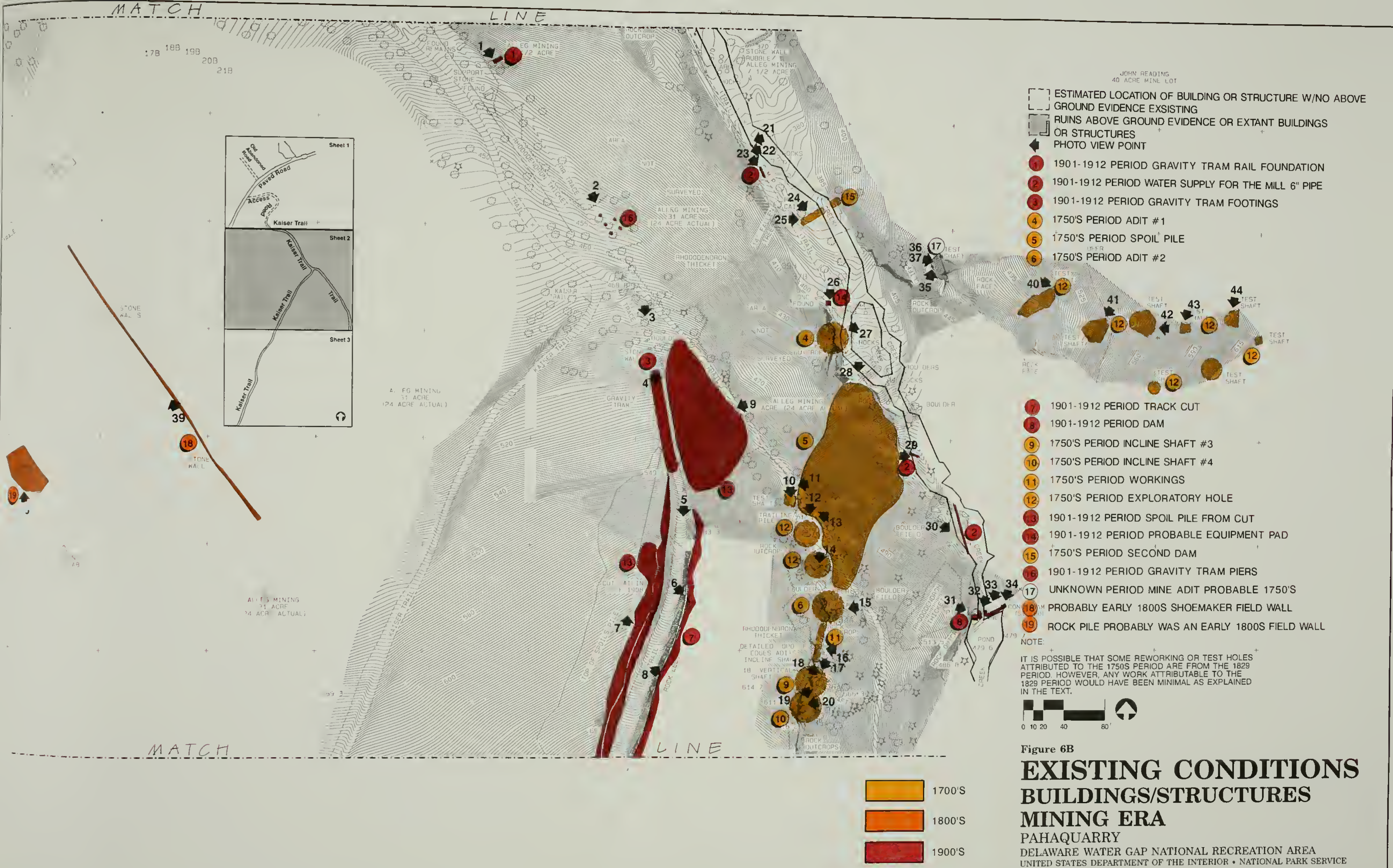

Figure 6B

EXISTING CONDITIONS
BUILDINGS/STRUCTURES
MINING ERA

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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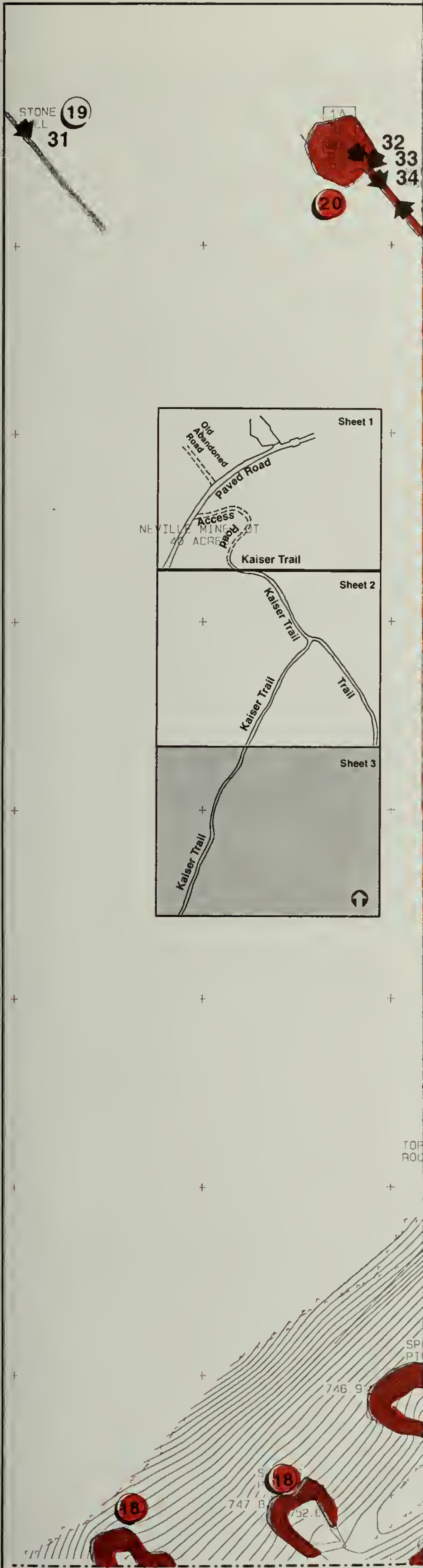

TRAIL

RUINS ABOVE GROUND EVIDENCE OR EXTANT BUILDINGS OR STRUCTURES

ESTIMATED LOCATION OF BUILDING SITE W/NO ABOVE GROUND EVIDENCE EXISTING

PHOTO VIEW POINT

1 1901-1912 PERIOD TIPPLE BUILDING

2 1841-1862 PERIOD SHAFT # 5 AREA OF SHED BUILDING

3 1901-1912 PERIOD ROCK CUT FOR TRACKS

4 1841-1862 PERIOD SHAFT #6

5 1841-1862 PERIOD OPEN CUT #7

6 1841-1862 PERIOD "ELEPHANTS BACK" OPENING #8

7 1841-1862 PERIOD SHALLOW SHAFT #9

8 1841-1862 PERIOD SMALL SHAFT #10

9 UNKNOWN PROBABLE 1841-1862 PERIOD SMALL TEST CUT

10 UNKNOWN PROBABLE 1841-1862 PERIOD TEST CUT

11 1841-1862 PERIOD DESCRIBED GENERAL LOCATION OF SMALL SHAFT #11

12 1841-1862 PERIOD DESCRIBED GENERAL LOCATION OF ADIT #12

13 1841-1862 PERIOD ADIT OR "CROSS-CUT" PROBABLY #13

14 UNKNOWN PERIOD "CROSS-CUT"

15 PROBABLE 1841-1862 PERIOD GENERAL AREA OF SHAFT #14

16 1901-1912 PERIOD SPOIL PILE

17 1901-1912 PERIOD PRIMARY QUARRY SITE

18 1901-1912 PERIOD SPOIL PILE

19 PROBABLE EARLY 1800S FIELD WALL

20 1901-1912 PERIOD SHAFT

NOTE:

IT IS POSSIBLE THAT SOME REWORKING OR TEST HOLES ATTRIBUTED TO THE 1750S PERIOD ARE FROM THE 1829 PERIOD. HOWEVER, ANY WORK ATTRIBUTABLE TO THE 1829 PERIOD WOULD HAVE BEEN MINIMAL AS EXPLAINED IN THE TEXT.

0 10 20 40 80

Figure 6C

EXISTING CONDITIONS
BUILDINGS/STRUCTURES
MINING ERA

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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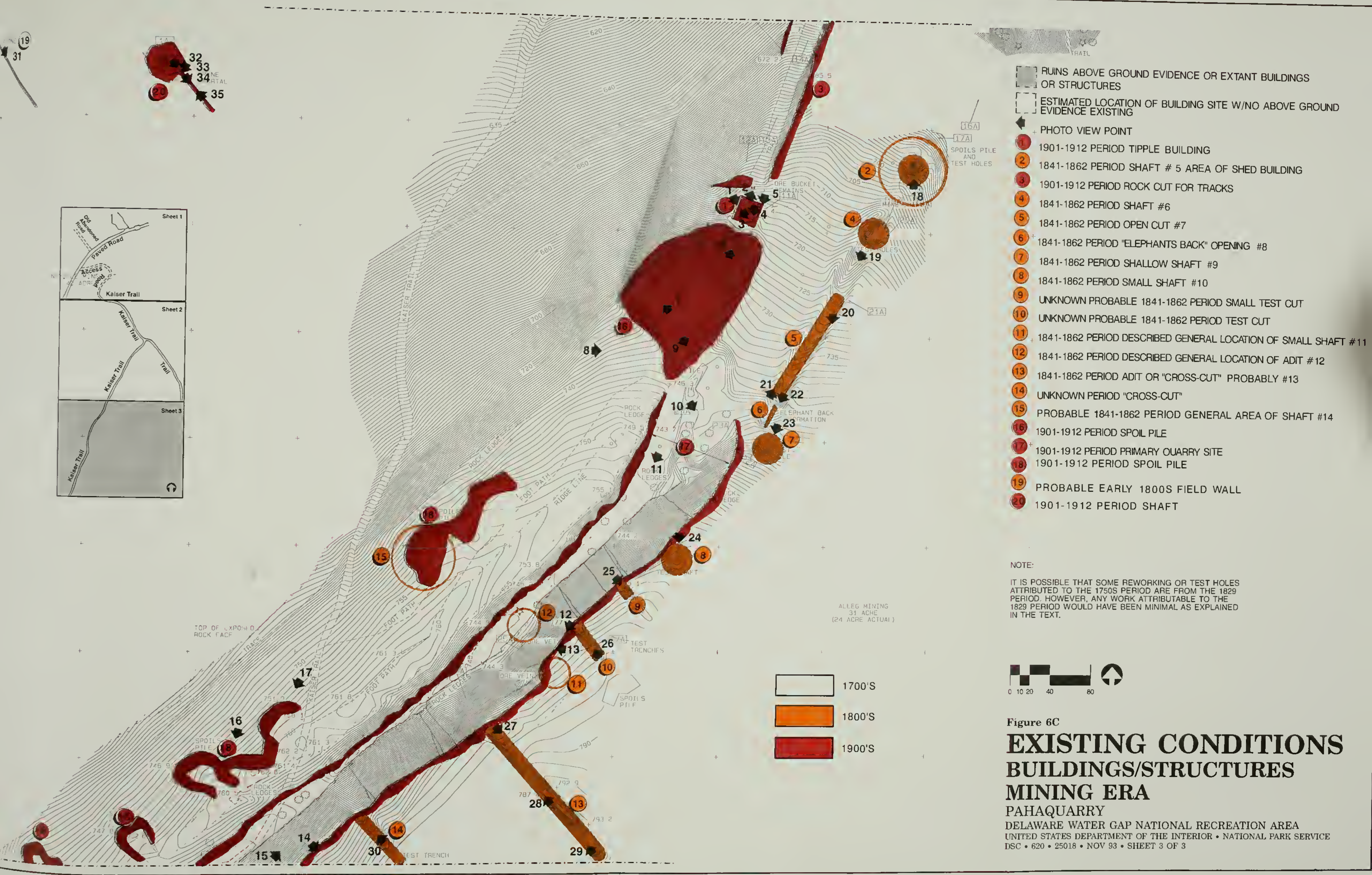

Figure 6C

EXISTING CONDITIONS
BUILDINGS/STRUCTURES
MINING ERA

PAHAQUARRY
DELAWARE WATER GAP NATIONAL RECREATION AREA
UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE
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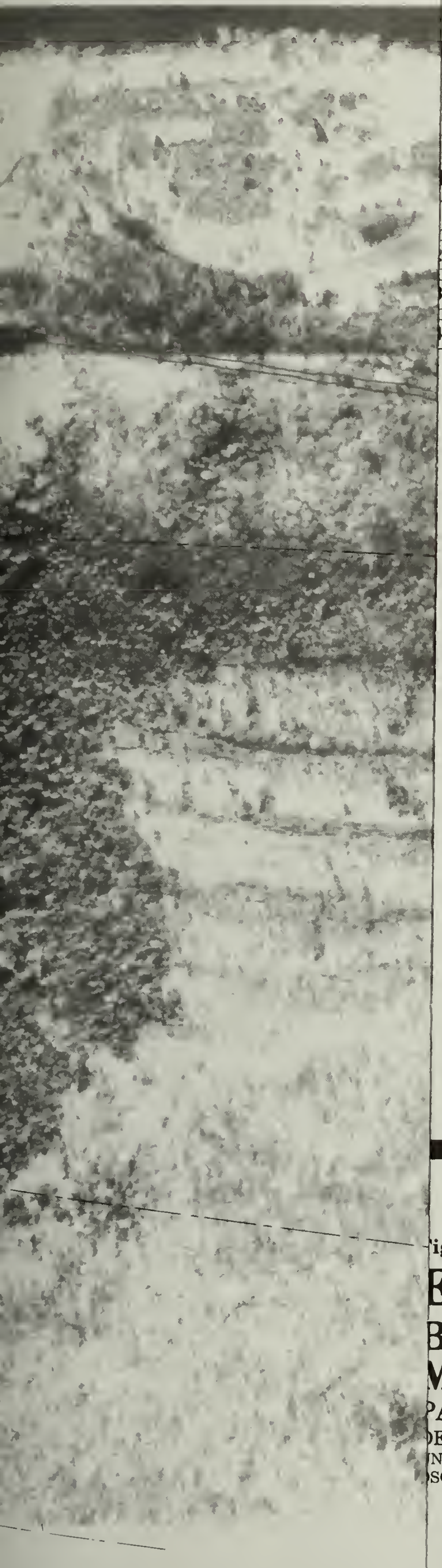

EXTANT OR ABOVE GROUND EVIDENCE EXISTING

ESTIMATED LOCATION OF BUILDING SITE W/NO ABOVE GROUND EVIDENCE EXISTING

PHOTO VIEW POINT

POSSIBLY 1750S APPARENTLY PLACED BOULDERS ALONG RAVINE BANK

PROBABLY EARLY 1800S FIELD STONE ROCK WALL

POSSIBLE 1750S EXPLORATORY MINE SITE IN ROCK OUTCROP

POST 1830 "OLD MINE ROAD" DRY LAID STONE RETAINING WALL

200 400 800 FEET

Figure 6D

EXISTING CONDITIONS
BUILDINGS/STRUCTURES/ MINING ERA

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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EXTANT OR ABOVE GROUND EVIDENCE EXISTING

ESTIMATED LOCATION OF BUILDING SITE W/NO ABOVE GROUND EVIDENCE EXISTING

PHOTO VIEW POINT

1. POSSIBLY 1750S APPARENTLY PLACED BOULDERS ALONG RAVINE BANK
2. PROBABLY EARLY 1800S FIELD STONE ROCK WALL
3. POSSIBLE 1750S EXPLORATORY MINE SITE IN ROCK OUTCRO
4. POST 1830 "OLD MINE ROAD" DRY LAID STONE RETAINING WALL

0 200 400 800 FEET

Figure 6D

EXISTING CONDITIONS
BUILDINGS/STRUCTURES/ MINING ERA

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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Figure 6A Photo 1
Front of “Powder House”

Figure 6A Photo 2
Mill Ruins

Figure 6A Photo 3
Mill ruins

Figure 6A Photo 4
Eastern end of mill ruins

Figure 6A Photo 5
Western end of mill ruins

Figure 6A Photo 6
Stone foundations of blacksmith shop and adjacent Boy Scout mess hall foundation and floor slab

Figure 6A Photo 7
North corner of blacksmith shop foundation with Boy Scout mess hall floor slab

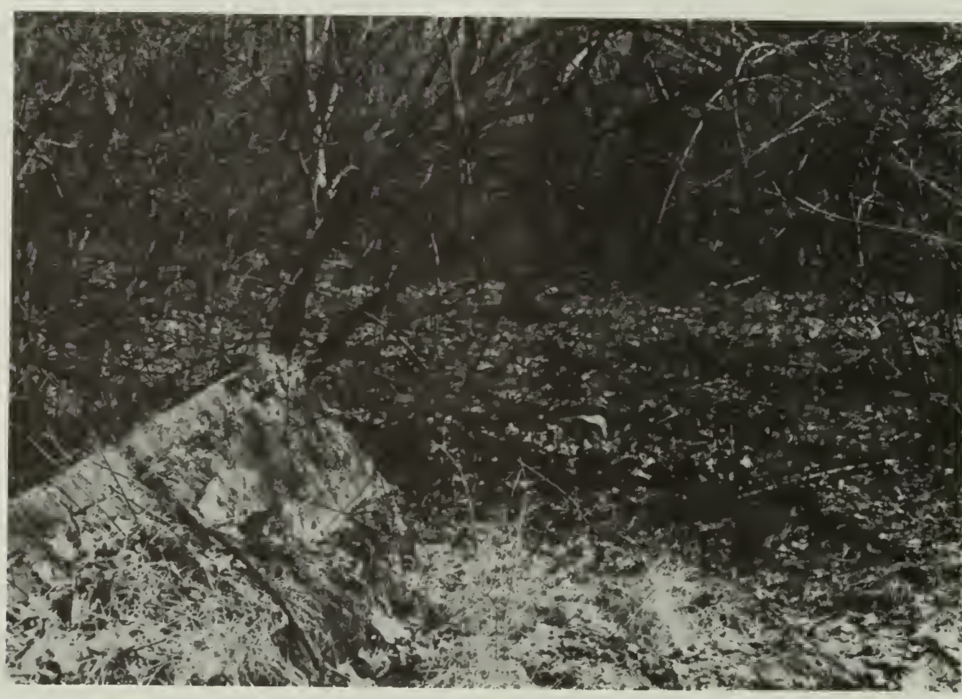

Figure 6A Photo 8
Boarding house site with foundation ruins

Figure 6A Photo 9
Mine oil house and Boy Scout trading post ruins looking northwest at southeast corner

Figure 6A Photo 10
Underground tank at approximately location of outbuilding north of boarding house

Figure 6A Photo 11
Oil house ruins with later Boy Scout addition for trading post

Figure 6A Photo 12
Site of 1847 mine buildings

Figure 6A Photo 13
Courtwright house retaining wall (1860)

Figure 6A Photo 14
Sawn timber probably dam cribbing not in situ (1909)

Figure 6A Photo 15
Sawn timber dam cribbing in situ (1909)

Figure 6A Photo 16
Concrete dam construction detail at failure (1909)

Figure 6A Photo 17
Concrete dam (1909); possible old mine road retaining wall (pre 1830)

Figure 6A Photo 18
Reservoir retaining wall 1909 or

Figure 6A Photo 19
Early 1900s period log dam remains in situ

Figure 6A Photo 20
Post 1830s period retaining wall along old mine road

Figure 6A Photo 21
Pre 1830s period old mine road bridge abutment remains on mine brook

Figure 6A Photo 22
Pre 1830s period old mine road bridge abutment remains on mine brook

Figure 6A Photo 23
Pre 1830s period old mine road bridge abutment remains on mine brook with Boy Scout abutment in foreground

Figure 6A Photo 24
19th century round stone-lined privy

Figure 6A Photo 25
1909 depression probably for drain or leaching in front of 1909 mill addition

Figure 6A Photo 26
1906 period retaining wall at northwest corner of mill

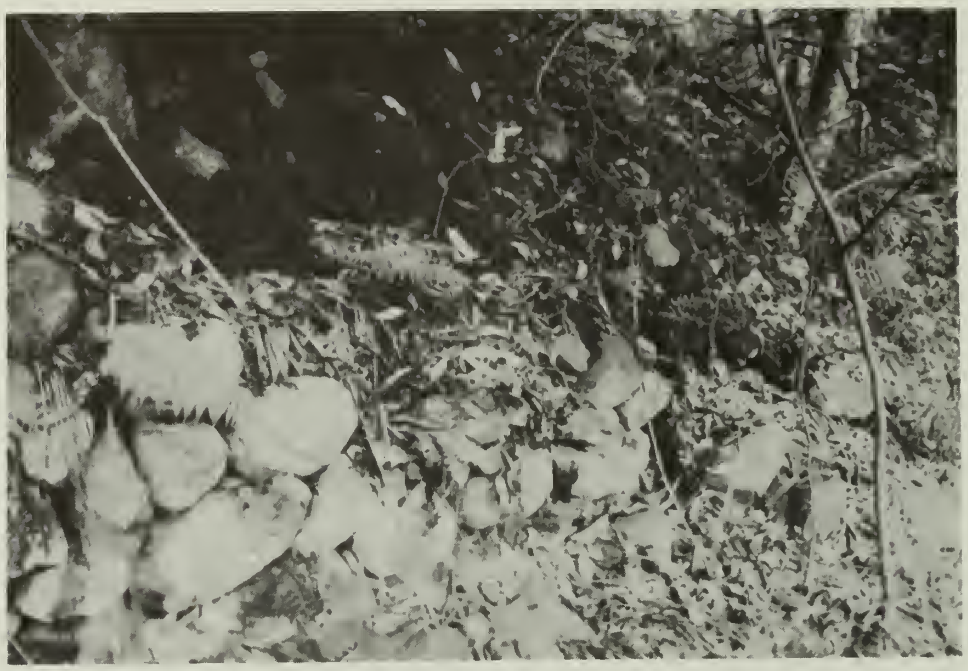

Figure 6A Photo 27
1908 period mill slope retaining wall

Figure 6A Photo 28
1908 period mill ore bin pier

Figure 6A Photo 29
1908 period mill in situ ore bin wall

Figure 6A Photo 30
1904 period mill retaining wall

Figure 6A Photo 31
1908 period mill ore bin piers

Figure 6A Photo 32
1908 period mill ore bin pier remains

Figure 6A Photo 33
1908 period mill pier for tramway trestle

Figure 6A Photo 34
1906 period mill wall probably for machinery

Figure 6A Photo 35
1908 period mill remains of pier for tramway trestle incorporated into Boy Scout structure slab

Figure 6A Photo 36
1904 period mill wall remains possibly in area of Dr. Keith's original concentration method furnace

Figure 6A Photo 37
1900s period possible chimney associated with unknown mine building later Boy Scout cooks quarters

Figure 6A Photo 38
1900s period unknown mine building site with visible foundation depression

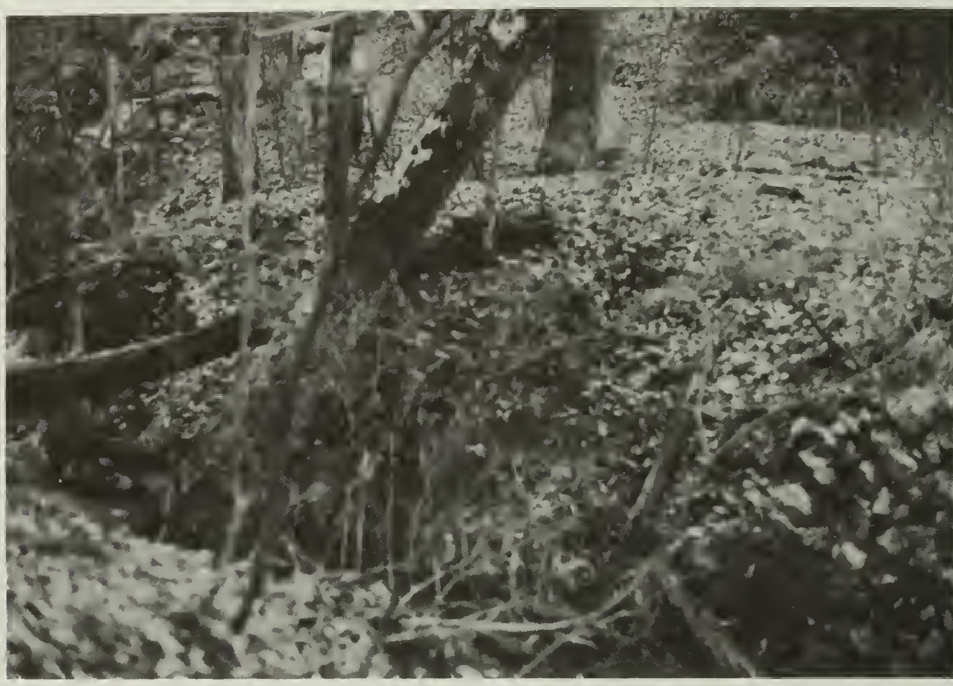

Figure 6A Photo 39
1901 period spoil pile retaining walls on mine brook

Figure 6A Photo 40
1901 period spoil pile retaining walls on mine brook

Figure 6A Photo 41
1901 period spoil pile retaining walls on mine brook

Figure 6A Photo 42
1901 period spoil pile retaining wall collapsed section

Figure 6A Photo 43
1750s period lower dam remains

Figure 6A Photo 44
1750s period probable tail race alignment form lower dam

Figure 6A Photo 45
1750s period lower dam where cut through by mine brook

Figure 6B Photo 1
1908 possible beginning of elevated section of train

Figure 6B Photo 2
1908 tramway footings of dry laid stone piles 10 feet apart

Figure 6B Photo 3
1908 tramway trace with stone track footings

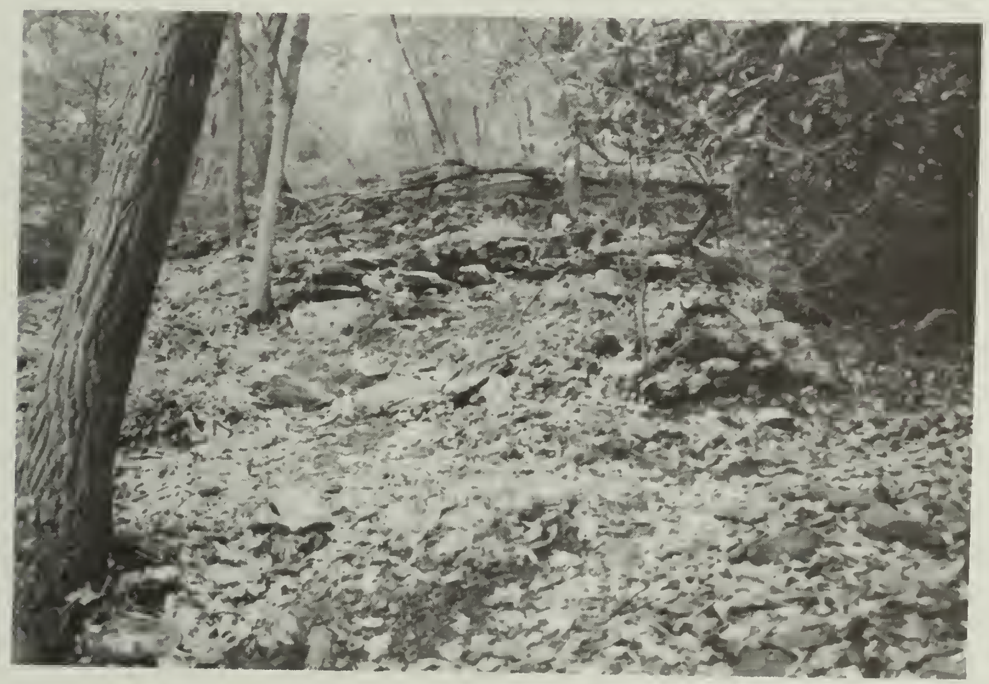

Figure 6B Photo 4
1908 tramway trace with stone track footings

Figure 6B Photo 5
1908 tramway "cut"

Figure 6B Photo 6
1908 tramway "cut"

Figure 6B Photo 7
1908 spoil pile from tramway cut

Figure 6B Photo 8
1908 tramway "cut" wall

Figure 6B Photo 9
1908 spoil pile from tramway cut

Figure 6B Photo 10
1750s prospect hole below adit number 2

Figure 6B Photo 11
1750s workings below adit number 2

Figure 6B Photo 12
1750s tailings from workings below adit number 2

Figure 6B Photo 13
1750s tailings on slope above adit number 1

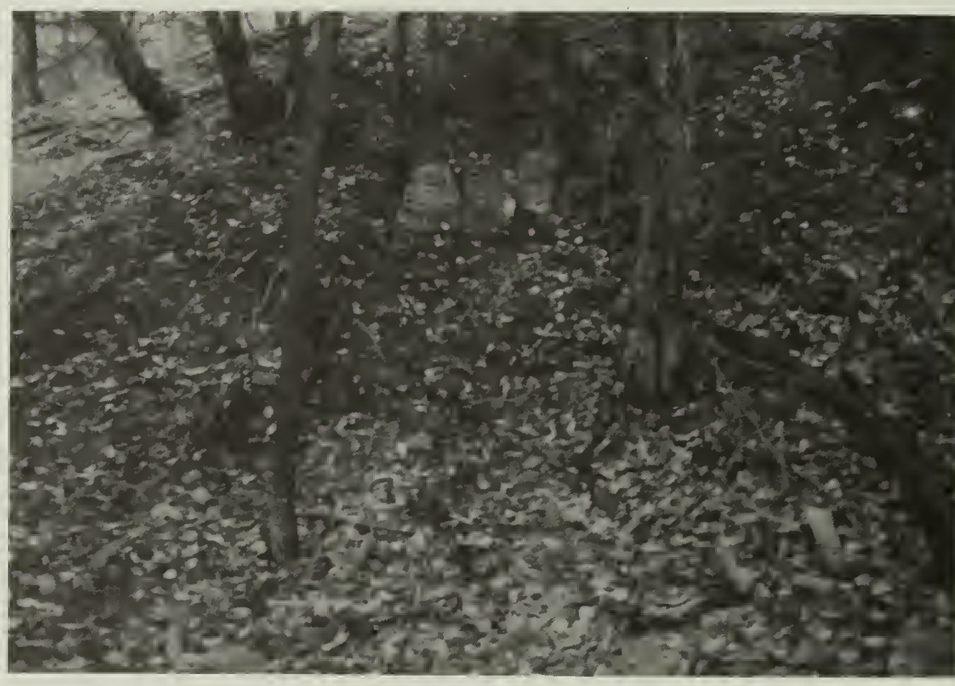

Figure 6B Photo 14
1750s workings below adit number 2

Figure 6B Photo 15
1750s adit number 2

Figure 6B Photo 16
1750s workings along trench below incline number 3

Figure 6B Photo 17
1750s incline 3 and 4 (number 3 in foreground)

Figure 6B Photo 18
1750s workings looking down from incline 3 and 4

Figure 6B Photo 19
1750s pockets cut in rock above incline 4

Figure 6B Photo 20
1750s incline number 4

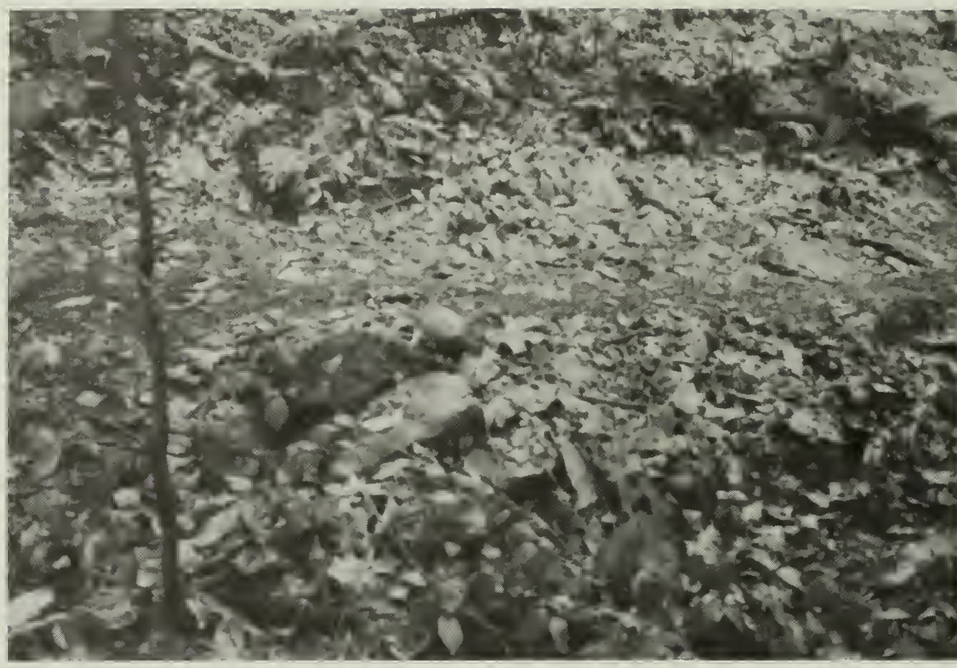

Figure 6B Photo 21
Unknown period possible 1750s stone retaining wall on upper side of mine brook road

Figure 6B Photo 22
Unknown period possible 1750s stone retaining wall on lower side of mine brook road

Figure 6B Photo 23
1904 6" water line from upper dam to mill

Figure 6B Photo 24
1750s colonial period remains of upper dam

Figure 6B Photo 25
1750s colonial period remains of upper dam

Figure 6B Photo 26
1901 concrete pad near adit 1 probably used for equipment

Figure 6B Photo 27
1750s period adit number 1

Figure 6B Photo 28
1750s period tailings from adit number 2 above

Figure 6B Photo 29
1904 “ water line from upper dam to mill

Figure 6B Photo 30
1904 6" water line from upper dam to mill

Figure 6B Photo 31
1904 and 1955 stone mining dam with later Boy Scout concrete dam constructed over it

Figure 6B Photo 32
1904 and 1955 stone mining dam with later Boy Scout concrete dam constructed over it

Figure 6B Photo 33
1904 and 1955 stone mining dam with later Boy Scout concrete dam constructed over it

Figure 6B Photo 34
Detail of 1904 and 1955 stone mining dam and later Boy Scout construction

Figure 6B Photo 35
Colonial mine adit across from lower tunnel no. 1 above Minebrook.

Figure 6B Photo 36
Colonial mine adit across from lower tunnel no. 1 above Minebrook.

Figure 6B Photo 37
Closeup of rock at colonial mine adit across from lower tunnel no. 1 above Minebrook

Figure 6B Photo 38
Rock pile probably from early 1800s field wall moved by Boy Scouts. West of Minebrook above old mine road

Figure 6B Photo 39
Stone field wall probably early 1800s on upper river terrace on former Shoemaker land.

Figure 6B Photo 40
Probable 1750s period exploratory shaft in ravine on the east side of Minebrook

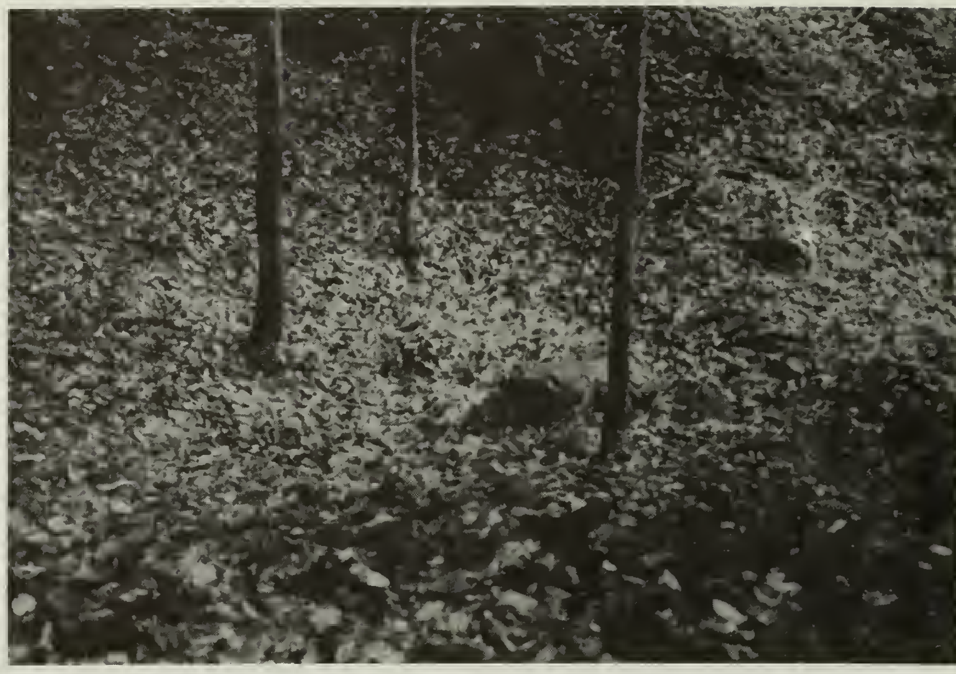

Figure 6B Photo 41
Probable 1750s period exploratory shaft in ravine on the east side of Minebrook

Figure 6B Photo 42
Probable 1750s period exploratory shaft in ravine on the east side of Minebrook

Figure 6B Photo 43
Probable 1750s period exploratory shaft in ravine on the east side of Minebrook

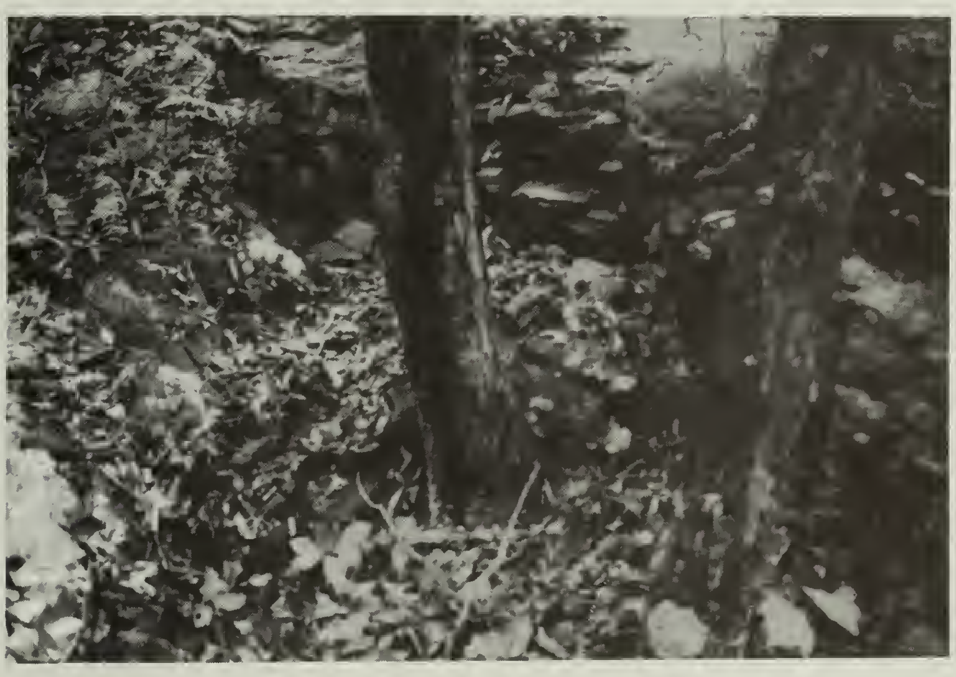

Figure 6B Photo 44
Probable 1750s period exploratory shaft in ravine on the east side of Minebrook

Figure 6C Photo 1
1908 remains of tipple building west wall

Figure 6C Photo 2
1908 ruins of tipple building and ore bucket

Figure 6C Photo 3
1908 in situ floor foundation and south stone wall remains

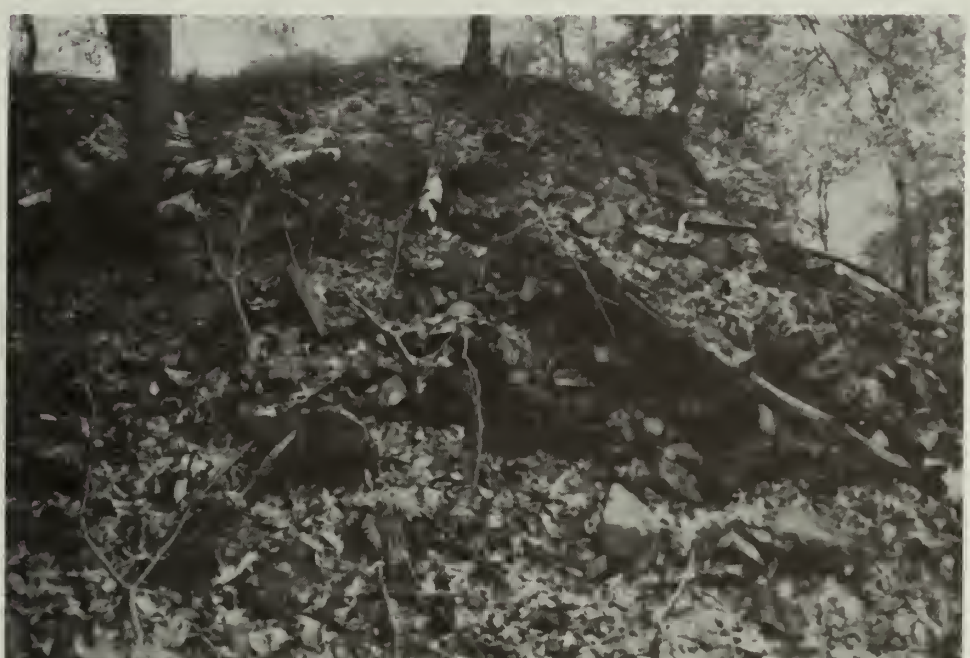

Figure 6C Photo 4
1908 spoil pile above tipple building site

Figure 6C Photo 5
1908 in situ remains of tipple building east wall

Figure 6C Photo 6
1908 remains of track bed of train from tipple building ore bucket in foreground

Figure 6C Photo 6
1908 remains of tipple building and track bed of train from spoil pile above

Figure 6C Photo 7
1907-1911 track trace on spoil pile

Figure 6C Photo 8
1909-1911 spoil material from the quarry

Figure 6C Photo 9
1909-1911 area from quarry site to spoil pile

Figure 6C Photo 10
Probable 1900s period grading work at quarry site entrance

Figure 6C Photo 11
1909-1911 quarry site

Figure 6C Photo 12
1907-1911 quarry site

Figure 6C Photo 13
1907-1911 quarry site

Figure 6C Photo 14
1907-1911 drill hole in quarry rock

Figure 6C Photo 15
1907-1911 quarry from south end

Figure 6C Photo 16
1909-1911 tailings northwest from quarry

Figure 6C Photo 17
1909-1911 tailings northwest from quarry

Figure 6C Photo 18
1847-1862 period shaft number 5

Figure 6C Photo 19
1947-1862 period trench number 7 from incline 6

Figure 6C Photo 20
1947-1862 period spoil pile at trench 7

Figure 6C Photo 21
1847-1862 period trench number 7

Figure 6C Photo 22
1847-1862 period “elephants back” workings number 8

Figure 6C Photo 23
1847-1862 period prospect hole number 9

Figure 6C Photo 24
1847-1862 period prospect hole number 10

Figure 6C Photo 25
1847-1862 crosscut above adit number 10

Figure 6C Photo 26
Unknown possible 1906 test trench south of adit number 10

Figure 6C Photo 27
Unknown probably begun in 1862 and reworked in 1901-1912 period very long test trench

Figure 6C Photo 28
Unknown probably begun in 1862 and reworked in 1901-1912 period very long test trench looking northwest

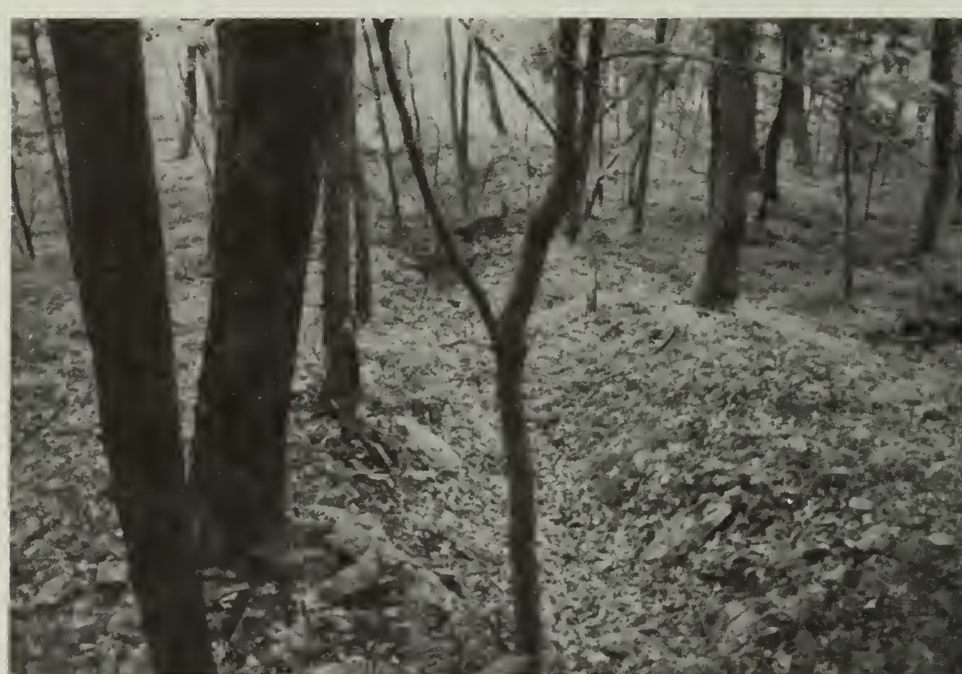

Figure 6C Photo 29
Unknown probably begun in 1862 and reworked in 1901-1912 period very long test trench looking northwest

Figure 6C Photo 30
Unknown probably begun in 1862 and reworked in 1901-1912 period test trench

Figure 6C Photo 31
Early 1800s field wall on upper river terrace west of Minebrook

Figure 6C Photo32
1900s era tunnel on upper river terrace west of Minebrook

Figure 6C Photo 33
1900s era tunnel on upper river terrace showing drill marks

Figure 6C Photo 34
1900s era tunnel on upper river terrace showing interior

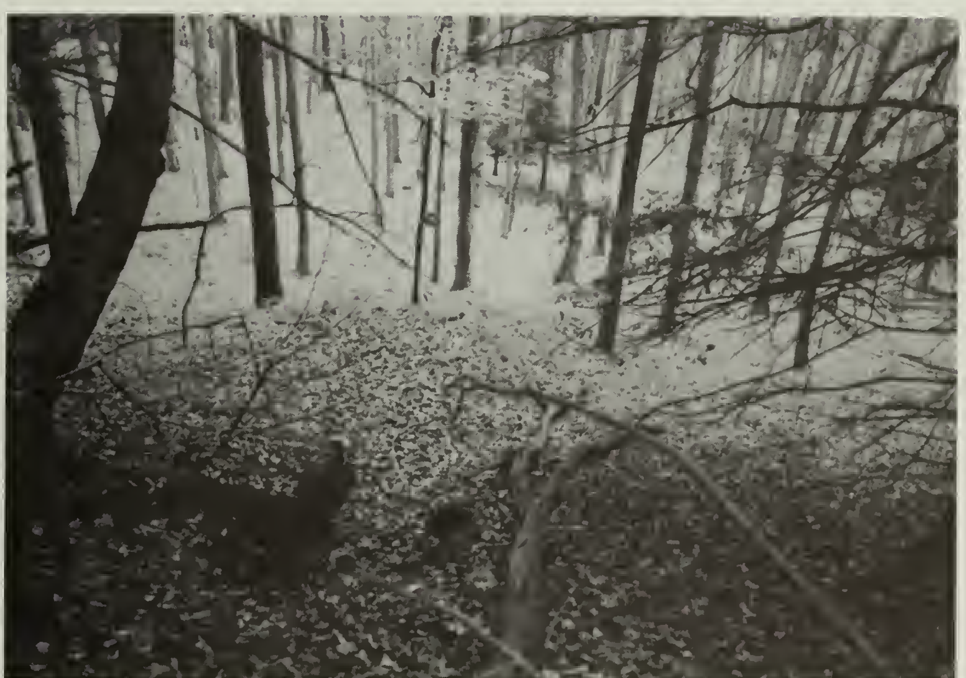

Figure 6C Photo 35
1900s era tunnel on upper river terrace from above looking at spoil pile

Figure 6D Photo 1
Possibly 1750s boulders apparently placed along ravine bank

Figure 6D Photo 2
Probably early 1800s field stone rock wall

Figure 6D Photo 3
Probable early 1800s stone field wall

Figure 6D Photo 4
Probable early 1800s stone field wall with trail opening probably made by Boy Scouts

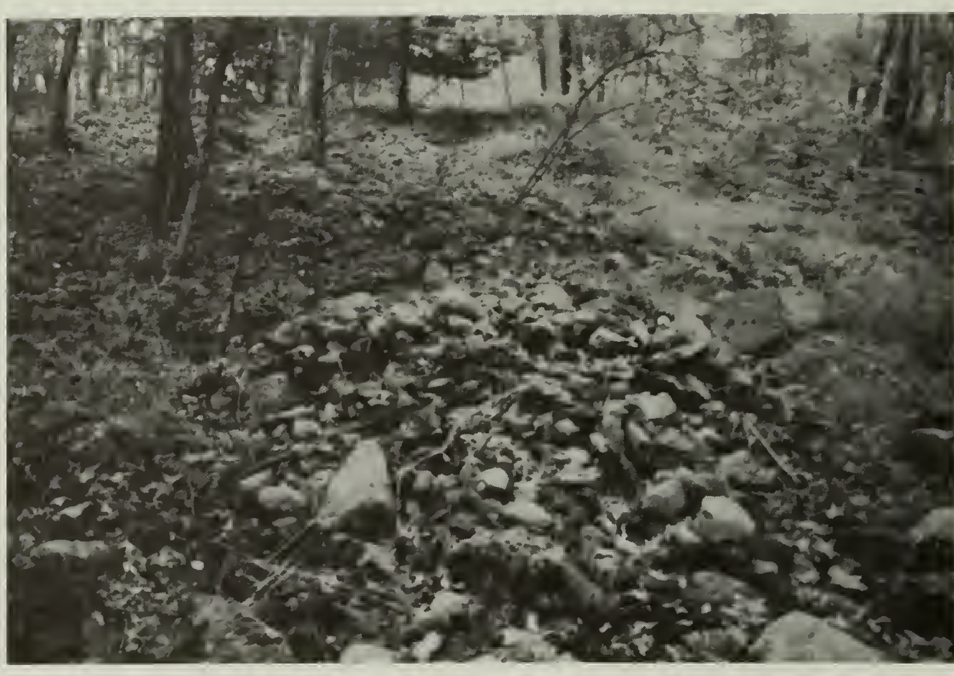

Figure 6D Photo 5
Probable early 1800s stone field wall

Figure 6D Photo 6
Rock face of outcrop thought to be focus of original 40 acre mine lot purchased in 1750s

Figure 6D Photo 7
Rock face of outcrop thought to be focus of original 40 acre mine lot purchased in 1750s

Figure 6D Photo 8
Close up of rock face on the south end of a possible 1750s exploratory mine area

Figure 6D Photo 9
Area of rock face thought to be worked in 1750s

Figure 6D Photo 10
View of rock face and spoil below possible area worked in 1750s

Figure 6D Photo 11
Looking east along rock face possibly worked in 1750s

Figure 6D Photo 12
Looking up rock face on east end of rock face thought to be worked in 1750s

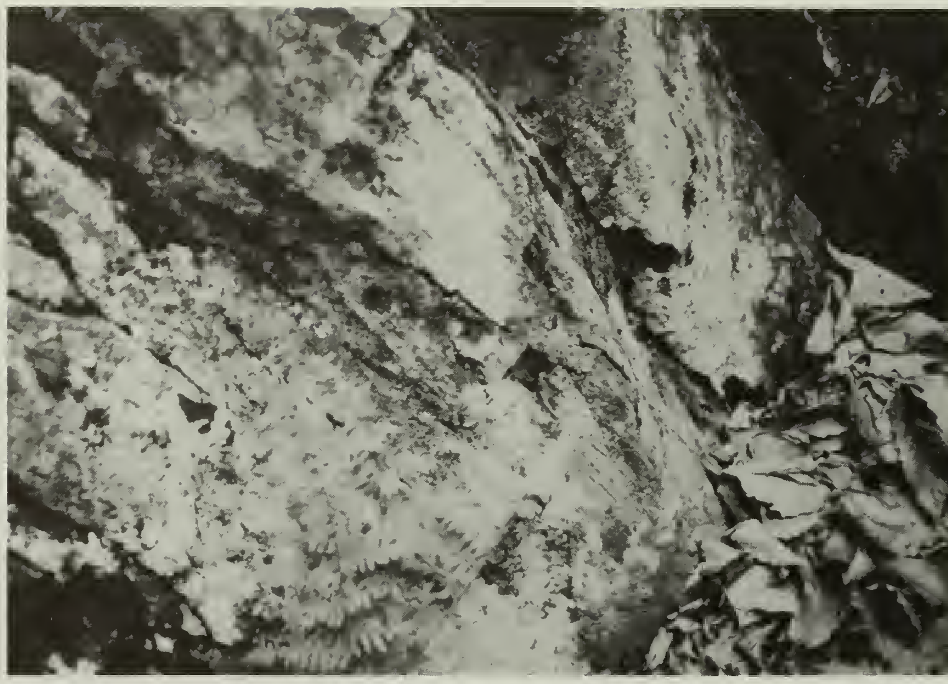

Figure 6D Photo 13
Close up of rock believed to be worked in 1750s

Figure 6D Photo 14
View of "spoil" from area possibly worked in 1750s

Figure 6D Photo 15
Collapsed section of post 1830 "Old Mine Road"

Figure 6D Photo 16
Post 1830 "Old Mine Road" wall

Figure 6D Photo 17
Post 1830 "Old Mine Road" wall

BOY SCOUT CAMP ERA TO THE PRESENT

The Boy Scouts occupied the Pahaquarry property from 1925-1970. During this time, they adapted much of the existing development from the previous mining activity as well as constructing new facilities. The remains of this layer of Boy Scout development on the landscape is shown on Figure 6E. The United States Army Corps of Engineers removed all of the development from the Boy Scout era as well as other periods. However, as shown on Figure 6E, remains of tent platform sites, latrines, drinking fountains, cabins, staff quarters, the Order of the Arrow site, dams, and other sites and structures can still be seen. Most of the ruins as shown in the photos associated with Figure 6E, however, exist as loose piles of concrete block due to the light nature of the Boy Scout construction.

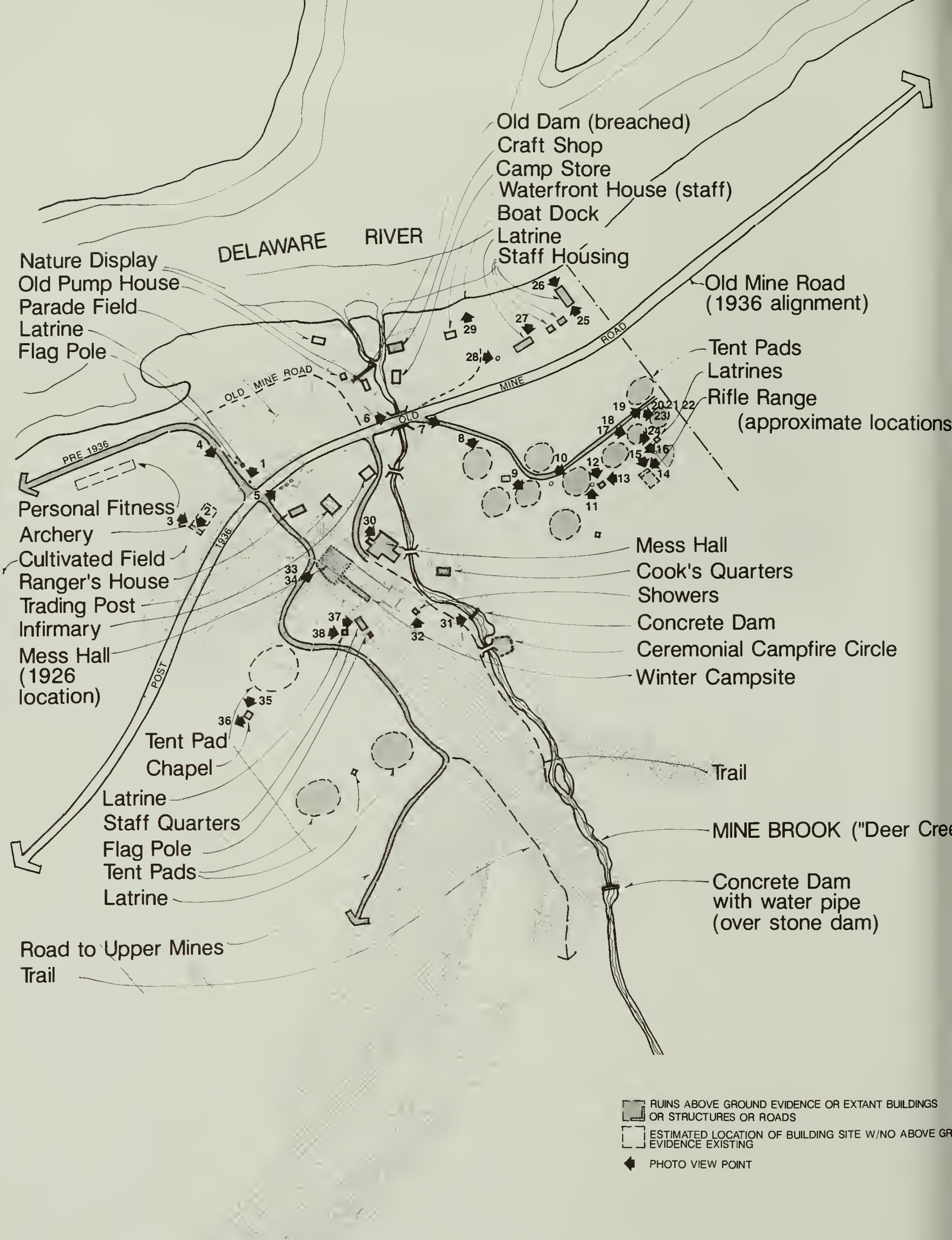

Figure 6E
EXISTING CONDITION
BUILDINGS/STRUCTURES/ CIRCULATION
BOY SCOUT ERA
PAHAQUARRY
DELAWARE WATER GAP NATIONAL RECREATION AREA
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Figure 6E Photo 1
Boy Scout period drinking fountain in former parade field area

Figure 6E Photo 2
Boy Scout period field near archery area

Figure 6E Photo 3
Boy Scout period archery site platform

Figure 6E Photo 4
Boy Scout period road to hotel (Dingmans Ferry) looking towards old mine road

Figure 6E Photo 5
Boy Scout period entry pillars to camp

Figure 6E Photo 6
Boy Scout period steps added to Minebrook bridge

Figure 6E Photo 7
Boy Scout period road to tent cabin sites

Figure 6E Photo 8
Boy Scout period ruins of Whinak camp site

Figure 6E Photo 9
Boy Scout period ruins of Wipok camp site

Figure 6E Photo 10
Boy Scout period ruins of log step walk to Schwangi camp site

Figure 6E Photo 11
Boy Scout period ruins of slab

Figure 6E Photo 12
Boy Scout period ruins of latrine

Figure 6E Photo 13
Boy Scout period ruins of latrine foundations

Figure 6E Photo 14
Boy Scout period ruins of rifle range

Figure 6E Photo 15
Boy Scout period ruins of rifle range

Figure 6E Photo 16
Boy Scout period ruins of amphitheater

Figure 6E Photo 17
Boy Scout period remains of “unami” camp site

Figure 6E Photo 18
Boy Scout period remains of “unami” camp site

Figure 6E Photo 19
Boy Scout period remains of access road to camp sites at East end

Figure 6E Photo 20
Boy Scout period remains of "Bischui" cabins

Figure 6E Photo 21
Boy Scout period remains of "Bischui" cabins

Figure 6E Photo 22
Boy Scout period remains of "Bischui" cabins

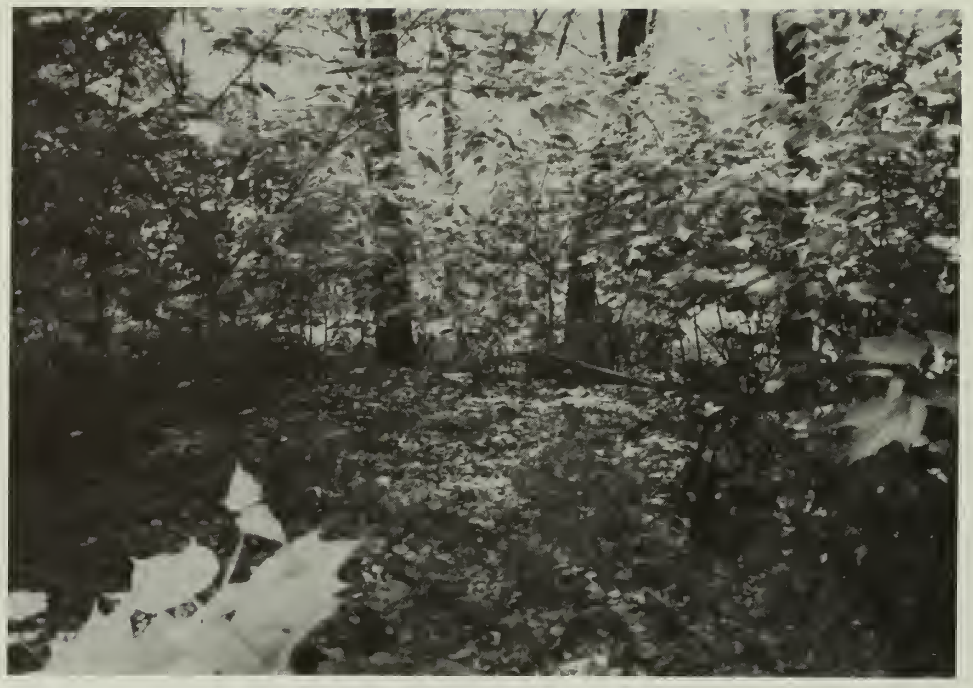


Figure 6E Photo 23
Boy Scout period remains of "Bischui" cabins

Figure 6E Photo 24
Boy Scout period remains of latrine near Bishui cabins

Figure 6E Photo 25
Boy Scout period remains of foundation for staff motel

Figure 6E Photo 26
Boy Scout era remains of foundation for staff motel

Figure 6E Photo 27
Boy Scout era remains of latrine

Figure 6E Photo 28
Boy Scout era remains of drinking fountain and clearing

Figure 6E Photo 29
Boy Scout era remains of access to dock and river

Figure 6E Photo 30
Boy Scout era remains of second mess hall added to mill

Figure 6E Photo 31
Boy Scout era dam on Minebrook

Figure 6E Photo 32
Boy Scout era remains of shower

Figure 6E Photo 33
Supposed Boy Scout era remains of unknown structure

Figure 6E Photo 34
Supposed Boy Scout era remains of unknown structure

Figure 6E Photo 35
Boy Scout era remains of chapel

Figure 6E Photo 36
Boy Scout era remains of chapel and pillars along walk to chapel

Figure 6E Photo 37
Boy Scout era remains of latrine and staff quarters

Figure 6E Photo 38
Boy Scout era remains of latrine and staff quarters

PART IV:
ANALYSIS AND INTEGRITY OF MINING PERIOD CHARACTER-DEFINING FEATURES

INTRODUCTION

Previous chapters have documented the historic context, significance, development, and existing conditions of the Pahaquarry property. This chapter will address integrity and identify those character-defining features of the mining landscape which contribute to the site's historical integrity and convey its significance. They are identified for each of the mining periods. Only character-defining features of the mining periods are identified since, based on National Register criteria, the later Boy Scout period is identified as having diminished significance because the United States Corps of Engineers removed much of the evidence of that presence during the early 1970s.

Overall the site retains historical integrity as a mining site in which the individual components may be gone or deteriorated but the system as whole is still recognizable and conveys its significance. The seven qualities of integrity as identified by the national register are followed by identification of character defining features for each period.

LOCATION

Although some of the buildings associated with mining at Pahaquarry have disappeared, the site retains integrity of location in the many ruins, roads, paths, patterns, and structures which are extant or exist as archeological evidence of the three centuries of copper exploration on the site. In addition, the relationships which existed between the natural characteristic of the property and how they were used and adapted during the mining periods is still evident and contributes to the integrity of location for the property.

DESIGN

Mining properties typically evolve through time as deposits are reworked or new technologies are applied to formerly unprofitable grades of ore. They are, therefore, rarely unaltered. This has been the case at Pahaquarry although it was never developed as a profitable mine and some alteration occurred as a result of the Boy Scout period of use. The reworking at Pahaquarry, in search of profitable ore, was also somewhat unusual for a mining property in that the later efforts did not obliterate earlier periods. Only minimal change occurred to earlier efforts as a result of the later reworking.

The remains, relationships, and patterns, which exist illustrate the evolution of the search for copper over three centuries and give the property overall integrity of design. The composition, spatial relationships between natural and cultural elements, and form of the landscape, which resulted from the search for copper is illustrated in the landscape today. The distinct systems and processes applied in the search for copper during each period are still evident although individual features may be missing, altered, or deteriorated. The property, nevertheless, as a result of those losses, and as a result of forest successional process, has had some loss of design integrity when considered for each period and for specific features. To some extent the patterns of spatial relationships which have lost some design integrity as a result of forest succession could be considered reversible through vegetation management.

SETTING

The Pahaquarry property overall retains a remarkable degree of integrity of setting for all mining periods. The natural characteristics of the property including Mine Brook and the Delaware River, which provided the setting for the mining development of the property, has changed little even from the 1700s colonial period. How the natural characteristics of the property were adapted and influenced each mining period is still evident. The greatest change in the setting for the mining property was the 1936 realignment and paving of Old Mine Road and the recent forest encroachment of previously open areas. The great number of ruins, spoil piles, adits, roads, and other cultural features in addition to the relatively unchanged natural characteristics give the property a high degree of integrity of setting.

MATERIALS

Pahaquarry retains a moderate degree of integrity of material remains due to the loss of buildings and minor changes during the Boy Scout period of use. The extant ruins, roads, mine workings, and other cultural features, however, still convey the original materials, construction, technology, and thinking of their builders spanning three centuries. The archeological potential to yield information on the material culture of these three periods of exploration is also very high.

WORKMANSHIP

As with integrity of materials, some loss of integrity of workmanship has occurred at Pahaquarry for specific lost features especially buildings. The overall workmanship in the organization and shaping of the landscape for the purposes of extracting copper, however, still exists. In addition, many extant cultural features which have survived intact or in ruins convey the workmanship of the original builders. This is especially true of the early twentieth century period which was the most extensive period of development and from which a greater number of features have survived.

FEELING

The setting and numerous ruins and cultural features of the Pahaquarry site convey a sense of feeling associated with the early explorations of copper on the site. The ruinous and abandoned feeling of the site also conveys a sense of the economic bust associated with the effort to extract copper from the property. The greatest impact to the integrity of feeling for the property is probably the recent encroachment of forest in important historically cleared areas and the 1936 realignment and paving of Old Mine Road. Boy Scout period developments and adaptations also impact the sense of feeling associated with the mining eras, but only to a minor degree since their affects were not extensive.

ASSOCIATION

As the location of three centuries of copper exploration with numerous remains from all three periods, and with its essentially unchanged setting, the Pahaquarry property retains integrity of association for the periods for which it is significant. Although changes from the Boy Scout period, Old Mine Road, and forest succession have lessened its integrity of association, the site still conveys to the observer the historical activity which occurred at the site.

CHARACTER-DEFINING FEATURES

1750s Mining Period

Patterns of Spatial Organization and Land Use

Since usage of the property has changed from the early mining period, patterns of spatial organization exist only through surviving features and relationships provided by the setting. For this earliest period the following character defining patterns of spatial organization are identified:

1. *Buildings were located on the level, buildable, river terrace and level area along Mine Brook.* These sites (mill and two-acre residential site) still exist although the buildings are gone.

2. *Mining developments were in close proximity to extraction sites.* Buildings are no longer extant although parts of the circulation system and the sites remain, and the exploration sites are extant. The rock outcrop which was on the original forty-acre Reading lot, and apparently thought to be the main deposit of ore, still exists in close proximity to the two-acre site for river access and is centrally located to the mine properties.

3. *The colonial mining development sites were small and compact.* Extraction sites are extant and nearly intact. The development sites are extant although the speculated mill site has probably been altered by a later period spoil pile. Remains of the colonial dams are extant.

4. *Development sites required and exploited ease of river access for transportation.* Parts of the circulation system connecting extraction and development sites as well as extraction and dam remains are extant, indicating their connection to the two-acre lot and its river access. The two-acre lot contained buildings which are no longer extant, and must have had a dock for river access.

5. *The mining property was largely forested except for small cleared areas for building development sites.* The forested cover over the property is extant although the development sites are being reclaimed by forest succession.

6. *Agricultural development of surrounding properties was limited, and for the mining property, was likely limited to a small area on the two-acre building lot.* Agricultural fields or development patterns are no longer extant on the two-acre building lot.

Response to Natural Features

1. *The geologic character of the property greatly affected the location and extent of exploration activity.* Exploration sites are extant and nearly intact from the colonial period.

2. *The geologic character of the property was the bases of original land ownerships, boundaries, and development.* The original property and geological setting and character of the property is extant.

3. *The topographical characteristics of steep ridges, level river terraces and ravines, influenced locations for building sites and river access.* The sites of development and their setting and topographic character are extant. In addition, remnant features associated with that development are extant. The mill and buildings associated with the two-acre residential site are not extant.

4. *The topographic character of the property influenced and determined the location of roads and trails.* The original Old Mine Road, possible bridge abutments, as well as other roads from the colonial period are extant in traces. The topographic character is extant.

5. *The property remained essentially under forest cover with limited clearing probably only on the developed sites.* The largely forested character over the property is extant. Cleared areas no longer exist.

6. *The river and Mine Brook provided both transportation and power for the mining operation.* The river and Mine Brook still exist as well as the setting for the mill and river access site. Remains of the mill dams and possibly parts of the race are extant.

Cultural Traditions

1. *Mining and processing technology employed at the Pahaquarry site was relatively simple reflecting colonial period knowledge.* The mining exploration shafts, adits, test holes, and spoil piles are extant as well as road traces, remains of dams, and a possible race. The setting and relationships on the property in the flow of ore from extraction to shipment can still be discerned. None of the buildings are extant.

2. *There was little development of labor class hierarchy in housing.* The site of the residential development exists, but no structures are extant.

Circulation Networks

1. *Roads were simple, narrow dirt paths connecting mining sites and support facilities. They closely fit the topography and had limited construction associated with their development.* Remnant traces of roads, which indicate earlier relationships and are likely from this earliest era, are extant. Many of the circulation paths and roads which must have existed are no longer extant.

2. *There was a strong dependence on the Delaware River location and relation to the mining sites and support facilities for transportation.* The river and its setting still exists as an indication of this relationship.

Buildings and Structures
1. *Development included residential buildings such as a house, barn, and outbuildings which were most likely constructed of local material.* None of these buildings are extant.

2. *Development, included a stamp mill, dams, and race for processing ore, was no doubt constructed of local material.* The stamp mill is not extant. The speculated site of the stamp mill has been identified and may provide archeological information. Remains of the dams and perhaps a vestige of the race are extant.

3. *Hand dug adits, test shafts, and spoil piles were constructed in the search for ore.* These structures are extant.

4. *Boat loading docks were likely constructed for transporting ore along the Delaware River.* No boat docks are extant.

5. *Frames and pulley structures as well as timber shoring were likely constructed for digging adits.* None of these types of structures are extant although the upper incline shaft number 4 has indications of a footing notched in the rock.

1847-1862 Mining Period

Patterns of Spatial Organization and Land Use
1. *Roads and transportation routes and alternatives were expanded and improved from the colonial period.* Old Mine Road in its alignment from this period is extant in traces. The road established from Old Mine Road to the mine sites is intact.

2. *Extraction sites were more exploratory and speculative in their distribution and construction.* These sites are nearly all intact.

3. *Building and development of the mine property was limited and more speculative.* No buildings are extant, but the site with archeological evidence remains.

4. *Agricultural development of surrounding properties expanded to marginal slopes along the river.* Cleared fields have reforested and no longer exist. Stone field walls are extant along the marginal sloped river terrace.

5. *The mining property was still primarily forested with limited clearing except for the approximately thirty-three acres along the lower river terrace.* Parts of the cleared land along the lower river terrace are still cleared. Some of these formerly cleared lands are in a recent stage of forest succession.

Response to Natural Features
The geological, topographical, and vegetative natural characteristics of the mining property and their influence on use and development are essentially the same as for the 1700s period of mining development.

1. *The geologic character of the property greatly affected the location and extent of exploration activity.* Exploration sites are extant and nearly intact from the 1800s period.

2. *The geologic character of the property was the bases of original land ownerships, boundaries, and development.* The original property with its geological setting and character is extant.

3. *The topographical characteristics of steep ridges, level river terraces, and ravines influenced the location for building sites and river access.* The sites of development and their setting and topographic character are extant. In addition, remnant features associated with that development exist. Remains of the Courtright house which was originally the 1847 house/assay office are extant. No standing buildings remain.

4. *The topographic character of the property influenced and determined the location of roads and trails.* Traces of the post-1830 Old Mine Road are extant. The road to the upper exploratory workings is intact. Colonial roads which apparently were reused during this period to access the lower and upper adits are extant. Other roads from the colonial period exist in traces. The topographic character is extant.

5. *The mining property remained essentially under forest cover with limited clearing on developed sites.* Neighboring properties along the fertile lower river terrace as well as the marginal upper river terrace were cleared for farming. The largely forested character over the property is extant. Cleared areas are in various stages of forest succussion. Parts of historic fields remain cleared, but not farmed. Field walls of the marginal upper river terrace surrounding property are extant.

6. *The river provided transportation for the mining operation.* The river and its physical setting still exist.

Cultural Traditions
1. *The mining explorations were of a more speculative nature with limited development, simple mining, and no processing technology applied.* Exploration sites are extant. The site and remains of the 1847 house/assay building are extant, however, no buildings exist.

2. *Little development of labor hierarchy existed.* No residential buildings are extant, however, the site of the 1847 house/assay office remains.

Circulation networks
1. *Road development expanded and was differentiated from earlier simple paths. A greater level of construction was associated with this development including stone walls and bridges. The road surface was native soil.* Traces of the post-1830 Old Mine Road are extant including stone retaining wall work located both on and off the historic mining property. Remains of the post-1830 Old Mine Road bridge are extant. The road to the mine exploration sites (Keyser trail) exists. Road and retaining wall remains are extant from the 1847 house/assay office. Roads, used during the earlier colonial period which were reused to access the lower and upper adit sites, are extant.

2. *The road system still conforms closely to the existing landform.* The roads which are extant from this period are identified in number 1 above.

3. *The river provided transportation especially for the 1861-1862 mining operation.* The river and its physical setting still exist.

4. *Earlier roads accessing the lower and upper adits were adapted and reused.* These roads are extant.

Buildings and Structures
1. *Employee residential housing, outbuildings and structures were constructed of local material and had a vernacular style.* None of the residential buildings are extant however remains of the 1847 house/assay office (the later Courtright house) are extant.

2. *Mining site support structures included a shed and windless frame.* None of these are extant

3. *Ore explorations included various shafts, test holes, and extension of the colonial lower adit.* Nearly all of the ore exploration works and spoil piles are extant.

1901-1912 Mining Period

Patterns of Spatial Organization and Land Use
1. *Extraction support development was more specialized and existed in an organized complex.* Remaining portions of the support complex are extant including the mill, ore bin, tipple, tramway, blacksmith shop, oil house, boarding house, building of unknown use (later Boy Scout cook's residence), dams and water system, and retaining walls. The powder house is the only extant building. No above ground remains exist of the barn, assay office, ice house, pump house, and outbuildings associated with the assay office and boarding house.

2. *The mining development complex was extensive and incorporated local material and vernacular organization, layout and construction, typical of mining developments of the period.* Extant remains, which convey this character-defining feature, are listed in number one above.

3. *Extraction and exploratory sites were larger, farther from the support complex, and incorporated the transition from underground to open-pit quarry technology.* The quarry

site is extant. A lower underground "new tunnel" is extant although the portal has caved. An exploratory underground test adit also exists. Spoil piles remain from all these workings.

4. *Building development was concentrated on level, buildable, land and the lower terrace.* Extant buildings are identified in number one above.

Response to Natural Features
The geological, topographical, and vegetative natural characteristics of the mining property and their influence on use and development are essentially the same as for the 1700s and 1800s periods of mining development. Influences unique to this period have been previously noted, as well as extant features from this period.

1. *The geologic character of the property greatly affected the location and extent of exploration activity.* Exploration sites are extant and nearly intact from the 1900s period.

2. *The geologic character of the property was the bases of original land ownerships, boundaries and development.* The original property and geological setting and character of the property remains.

3. *The topographical characteristics of steep ridges, level river terraces and ravines influenced locations for building sites and river access.* The sites of development and their setting and topographic character exist. In addition, building and structure remains associated with that development are extant as previously identified.

4. *The topographic character of the property influenced and determined the location of roads and trails during the previous mining efforts. These routes were still used during the 1900s period.* Extant roads or traces of roads are identified in the section for the 1800s period. No new roads were developed during this period.

5. *The topographic character of the property influenced and determined location and construction for the tram and mill to provide gravity flow of the concentration process in the mill and gravity power for the tram.* Remains of the mill and tram are extant.

6. *With limited clearing for development, the mining property remained essentially under a new forest cover which resulted from cutting during the late 1800s.* Neighboring properties along the fertile lower river terrace were cleared for farming, while the upper marginal terrace were abandoned for agriculture. The largely forested character over the property is extant. Cleared areas are in various stages of forest succussion. Parts of historic fields remain cleared but not farmed. Rock field walls of the marginal upper river terrace surrounding the property are extant.

7. *The river provided limited transportation for the mining operation.* The river and its physical setting still exist.

8. *The availability of water from Mine Brook and the Delaware River supplied the concentration processes of the mill.* Remains of the dams, water lines, mill and Mine Brook are extant. The pump house building no longer exists.

Cultural Traditions

1. *The mining exploration was characterized by development of modern and experimental technology.* Extant resources which characterize this application have been previously identified.

2. *Housing development began to reflect a labor hierarchy in the work force.* Above ground archeological remains are extant from the boarding house and another presumed house which was later the Boy Scout cook's residence. The assay office/residence has been removed.

3. *Building and structure construction used local material and a vernacular style typical of mining development of the time.* Extant and non-extant buildings and structures of the period, which illustrate this characteristic, have been previously identified.

Circulation Networks

1. *Earlier road systems were adapted and reused from earlier periods.* Most of these roads are extant except those township roads identified in Figure 5D.

2. *Road systems continued to be simple, narrow ungraded dirt tracks.* Most of these roads are extant except as identified in Figure 5D.

3. *Use of the river was less extensive than previous periods.* Some use occurred during the winter for transportation on the ice. The river in its physical setting still exists.

4. *System of circulation expanded to include a gravity track tram and rails for moving ore and gangue.* Alignment of the tram and tracks are evident by extant tailings piles, depressions, track foundations, stone abutment walls on Mine Brook, topography, and the "cut."

Buildings and Structures

1. *Increase in the specialization of building and structure development reflecting the technological advances of the early twentieth century.* Remains of most buildings and structures are extant except those buildings shown in Figure 6A, 6B, and 6C.

2. *Extraction changed from underground tunnels to open pit quarrying reflecting technological advances.* Reworked tunnels, the new tunnel and the open quarry are extant.

3. *A larger scale of operation and development is reflected in the buildings and structures.* Working are more widely distributed reflecting technological advances. The quarry, tram, tailings piles, new tunnel, reworked tunnel, mill complex building and structure ruins are extant.

4. *Building construction reflects a functional early industrial vernacular design using local building material.* Extensive mill ruins are extant. One storage building is intact. Remains of the blacksmith shop and oil house are extant. The barn, boarding house, office, pumphouse, ice house, a building of unknown purpose, and Courtright house have little above ground remains.

PART V: TREATMENT AND DEVELOPMENT ALTERNATIVES

INTRODUCTION TO THE TREATMENTS CONSIDERED

NPS 28 Cultural Resource Management Guidelines release number 4, and the Secretary of the Interiors Guidelines for the Treatment of Historic Landscapes, identify five basic treatment strategies for historic properties. These are, Protection and Stabilization, Preservation, Rehabilitation, Restoration, and Reconstruction. For the Pahaquarry site only the first two overall strategies were considered.

Most of the contributing structural features of the site are ruins and others are archeological. Park management objectives also included limited interpretation and development of the site. These objectives as well as the nature of the cultural resources of the site made rehabilitation, restoration, or reconstruction, inappropriate as an overall treatment. Two general treatment strategies of protection and stabilization, and preservation, were then considered for the property. These two treatments are defined in the Secretary of the Interiors Guidelines as follows:

> Protection and Stabilization:
>
> Protection safeguards the existing condition of a landscape or its features by preventing further deterioration, loss, or attack, or to shield it from danger or injury. Stabilization re-establishes the strength of a structurally unsafe or damaged or deteriorated property or feature while retaining the essential form as it exists at present. Both protection and stabilization may be temporary in nature. They are employed to solve immediate threats to the condition of the landscape and are, thus, appropriate regardless of later treatments that may be undertaken. It should be noted that in depth historical research may not always be possible prior to undertaking emergency protection and stabilization work; however, it is consistently recommended in these guidelines.
>
> Preservation:
>
> The objective of this treatment is the retention and protection of the historic property's existing form, features, materials, and spaces. In addition to ongoing maintenance projects, preservation may include the repair and limited replacement of existing historic materials and features but does not allow for substantial replacement of missing features or new additions and alterations. Preservation as a treatment, allows for the interpretation of the evolution of the landscape, not just one historic period.

TREATMENT AND DEVELOPMENT ALTERNATIVES CONSIDERED

In addition to the above treatment strategies identified for the property, the park had a limited development program for the site which included development of a twenty-five car three bus parking lot, a composting toilet, and a limited level of interpretation. This interpretation initially included stabilizing the lower mine tunnel to resume ranger guided tours of the mine. The primary visitor experience, however, for the site was identified as a trailhead for the Appalachian trail.

Alternative treatments under the two identified strategies were drawn and presented to the Park and Regional office on April 6 1994. These are shown on Figures 8A, 9A, 9B, 9C, and 10A. Figures 7A, 7B, and 7C, illustrate significant cultural resource features and potential conflicts with existing vegetation. Significant rare or endangered plant and animal resource concerns are also identified on this drawing.

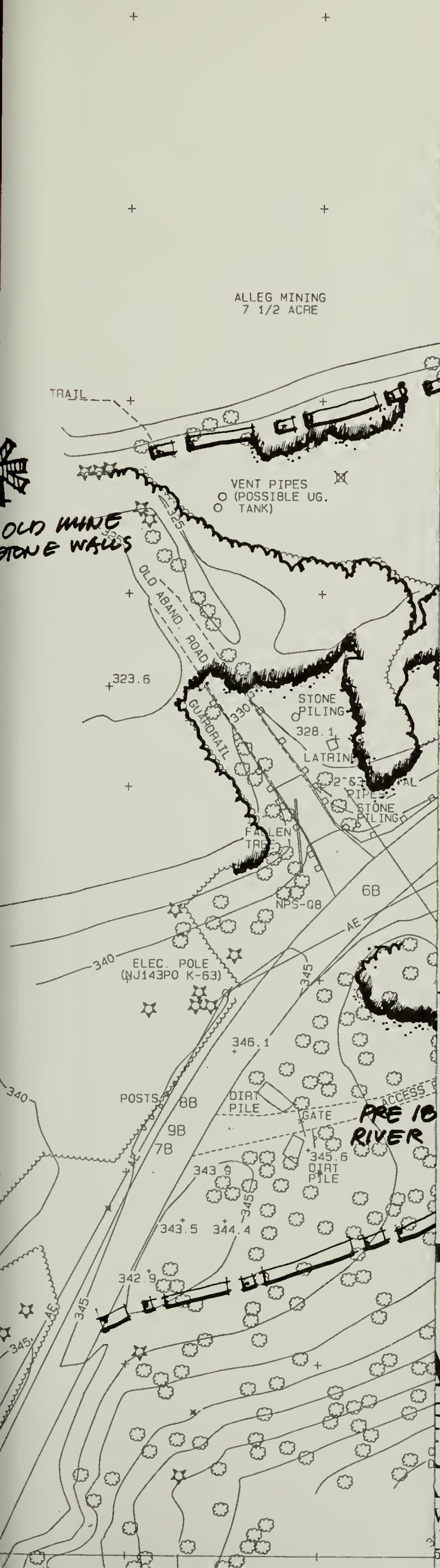
The two treatment strategies shown in the alternatives address differences in the site development program and different levels of management of the site vegetation as well as potential interpretive opportunities. The protection and stabilization alternative minimizes all new development and seeks to repair, replace, stabilize and monitor the condition of major cultural features of the mining period. Preservation attempts to more actively restore missing character defining features of the mining period while accommodating a more active visitor experience for the site. Following is a description of each of the alternative drawings:

STABILIZATION

This stabilization alternative, Figure 8A, seeks to stabilize and monitor existing ruins from the mining eras which are threatened. Vegetation removal would be done selectively where it threatens structural ruins. Repair to threatened structural features would be made for those highly deteriorated. Stabilization of structural features for the upper areas along Mine Book would be the same as shown on Figure 9B. Restoration of character-defining historically cleared areas would not occur. Interpretation would be limited to possible ranger led programs.

Parking development would be located in an area adjacent to, but off of, the historic mining property. The area was at one time cleared for agriculture as part of the Shoemaker (Dimmick) property, but is currently forested. The area is near, and visible from, the historic mining road and boarding house site. Handicap access to the mining features would not be provided due to the inability to develop an accessible route from this parking location.

Bus parking is separated from the car parking to minimize the impact of the parking lot size. Buses would park in a pullout along Old Mine Road and would turn around in the existing cleared area currently used for parking.



1900S VEGETATION CLEARING

VEGETATION AFFECTING FEATURE CONDITION

DECLINING BIRDS: WOODLAND SPECIES
OVENBIRD
RED EYED VIREO
SCARLET TANAGER
WOOD THRUSH

SPECIAL SPECIES CONCERNS

...ATMENT ALTERNATIVES
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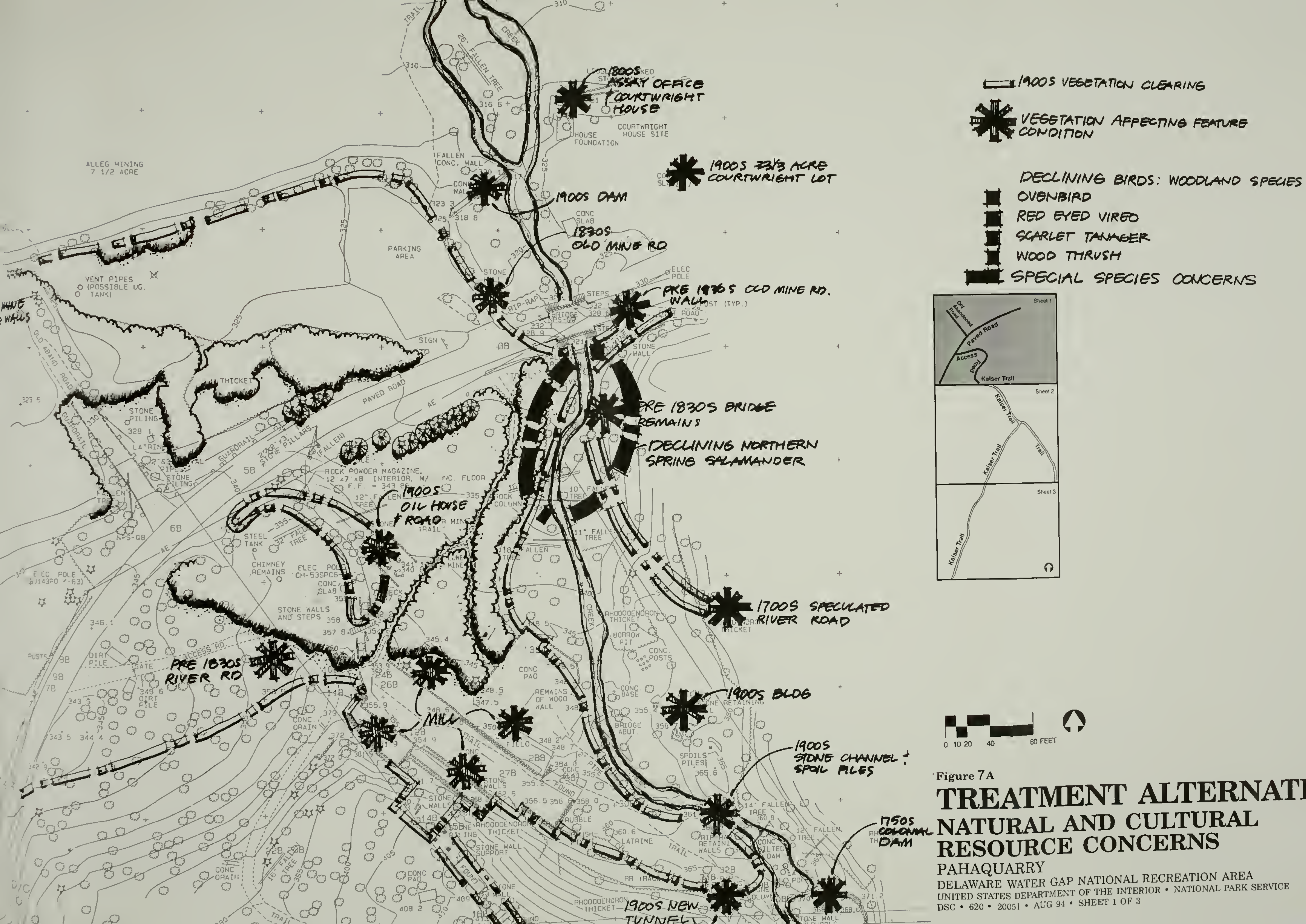

Figure 7A
TREATMENT ALTERNATIVES
NATURAL AND CULTURAL RESOURCE CONCERNS
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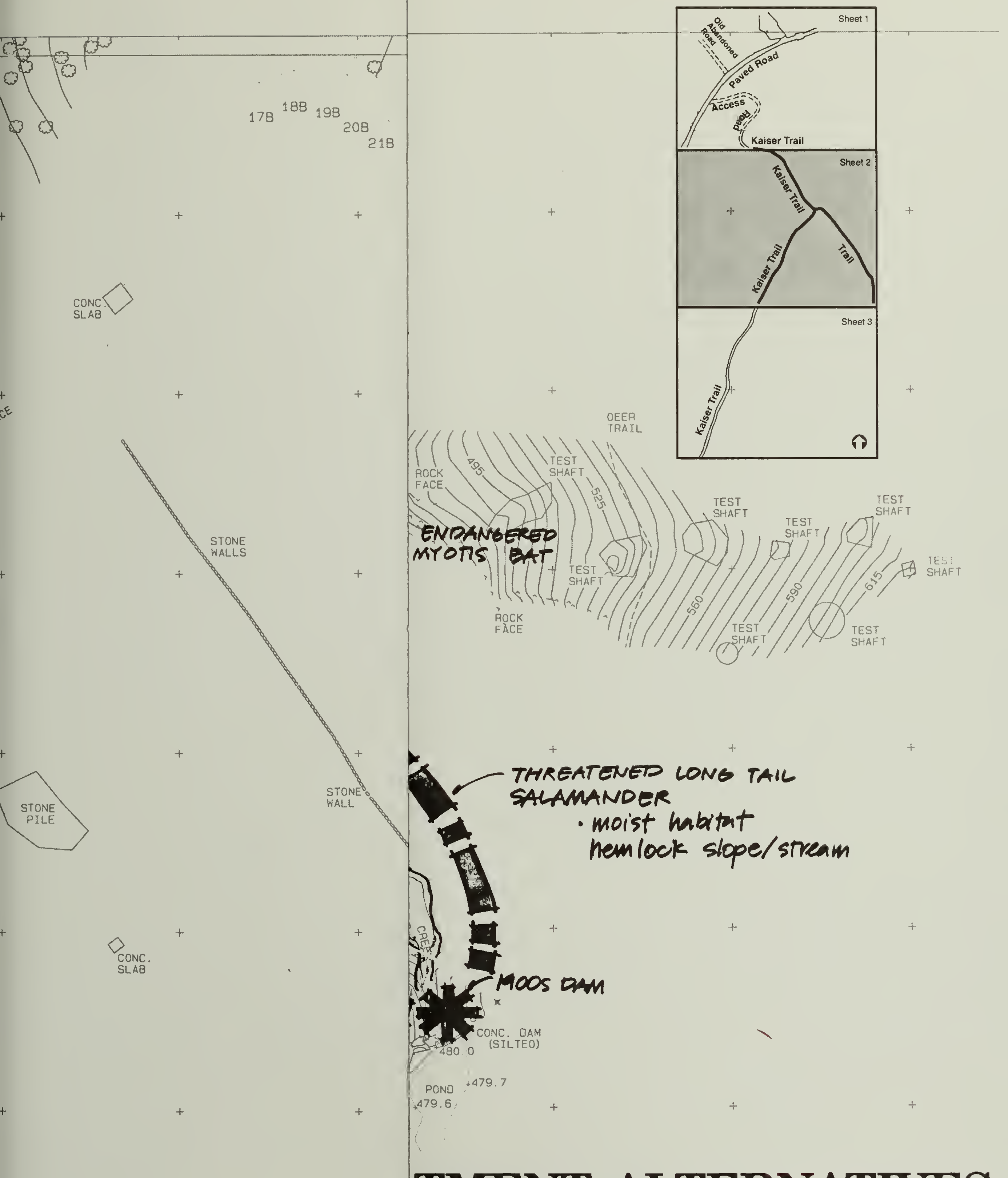

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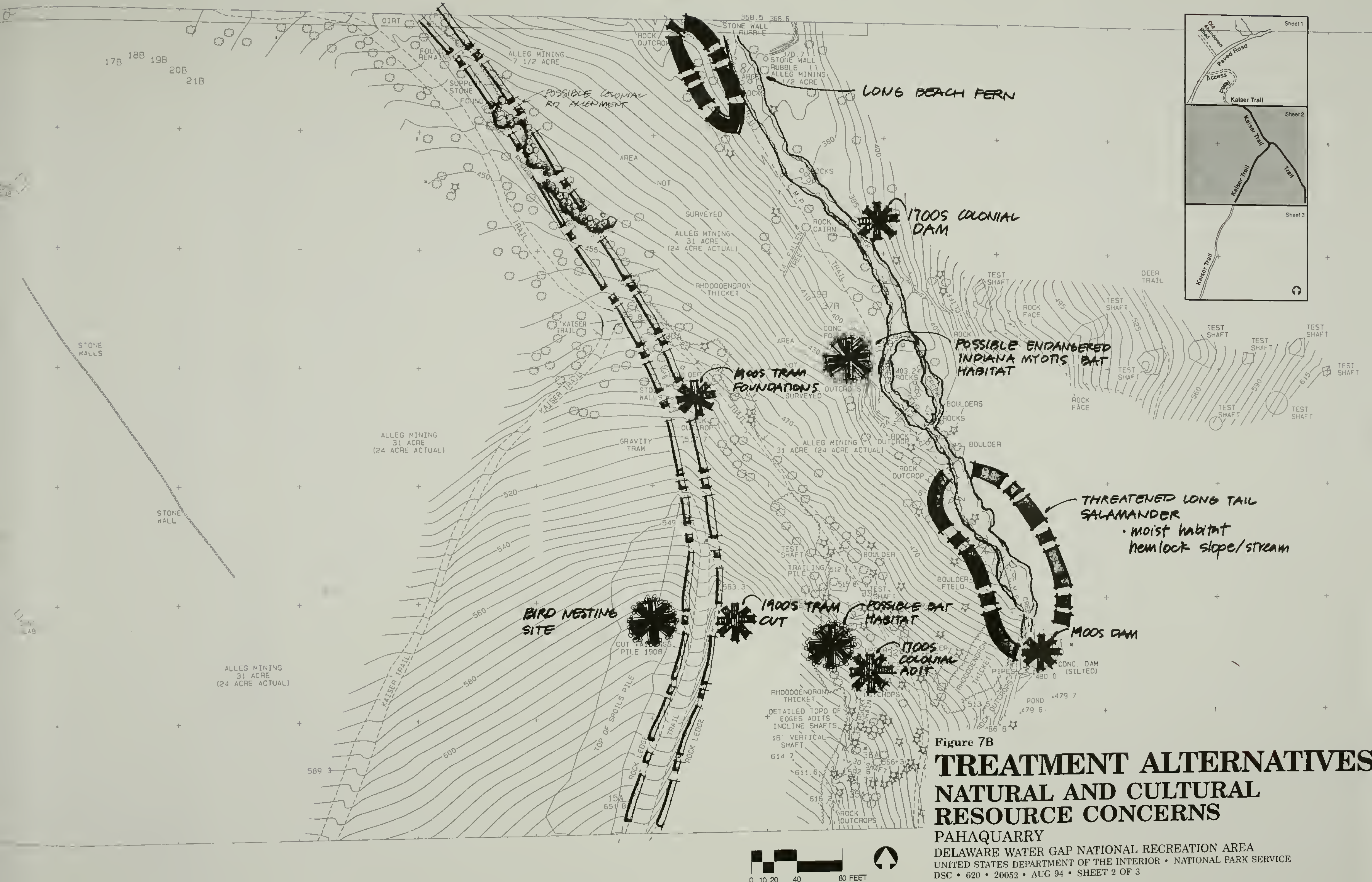

Figure 7B

TREATMENT ALTERNATIVES

NATURAL AND CULTURAL RESOURCE CONCERNS

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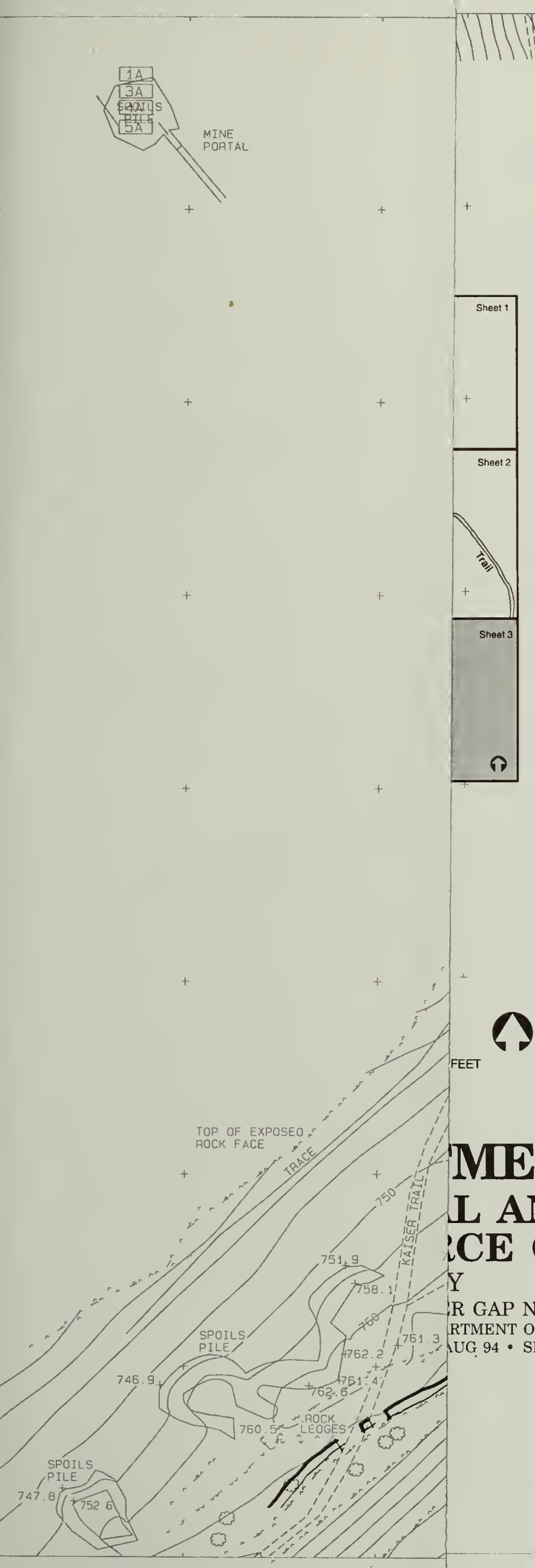

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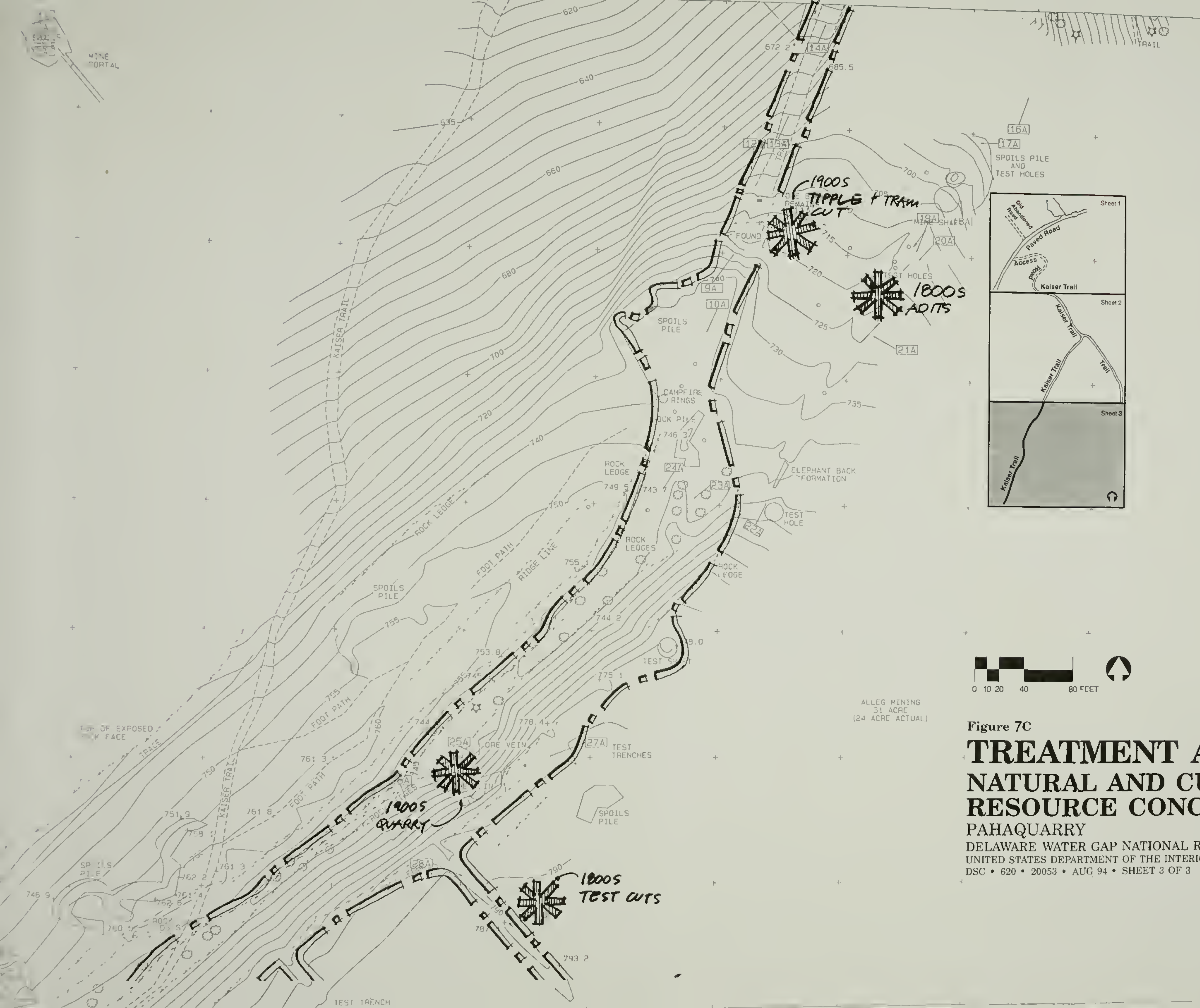

Figure 7C

TREATMENT ALTERNATIVES

NATURAL AND CULTURAL RESOURCE CONCERNS

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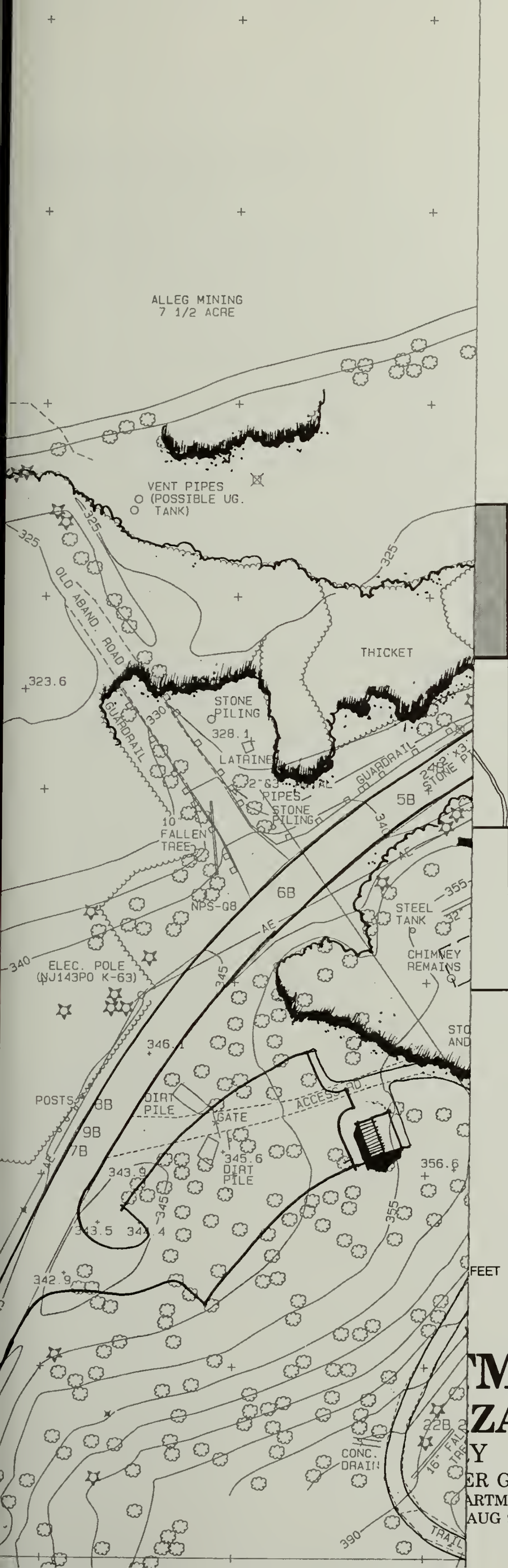

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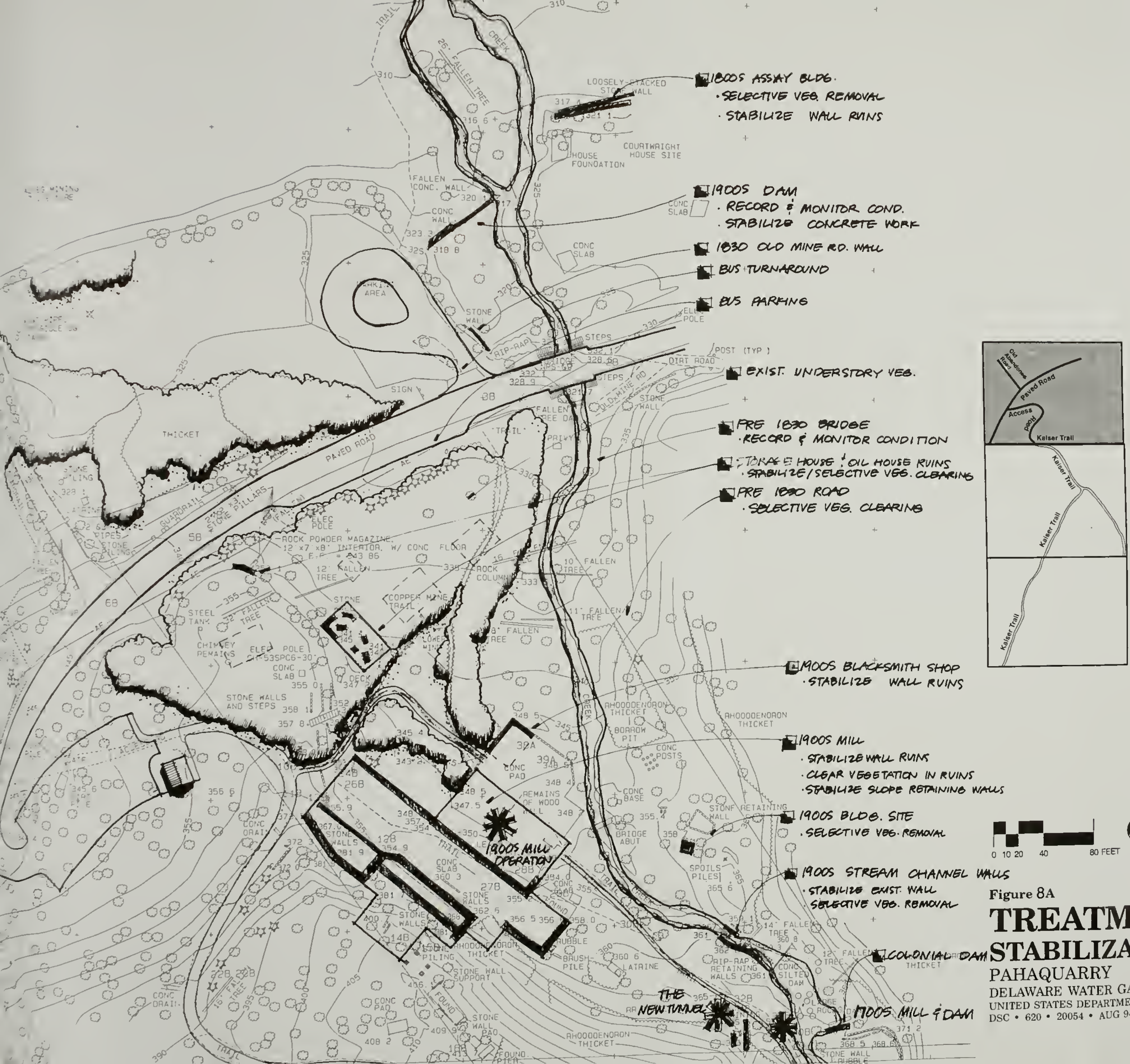

Figure 8A

TREATMENT ALTERNATIVES
STABILIZATION

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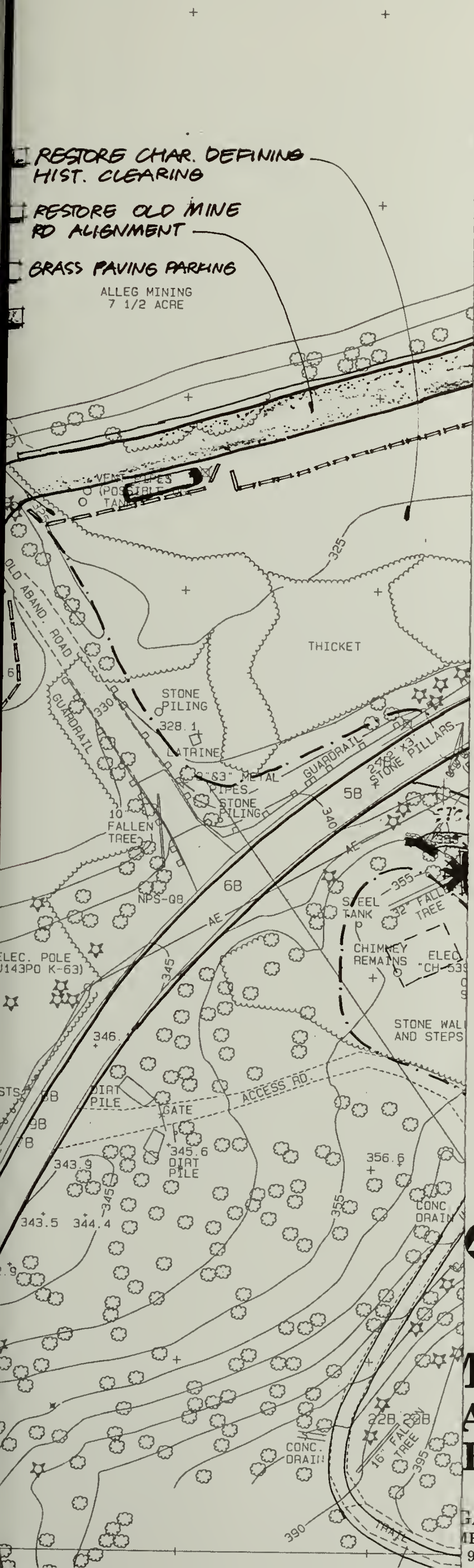

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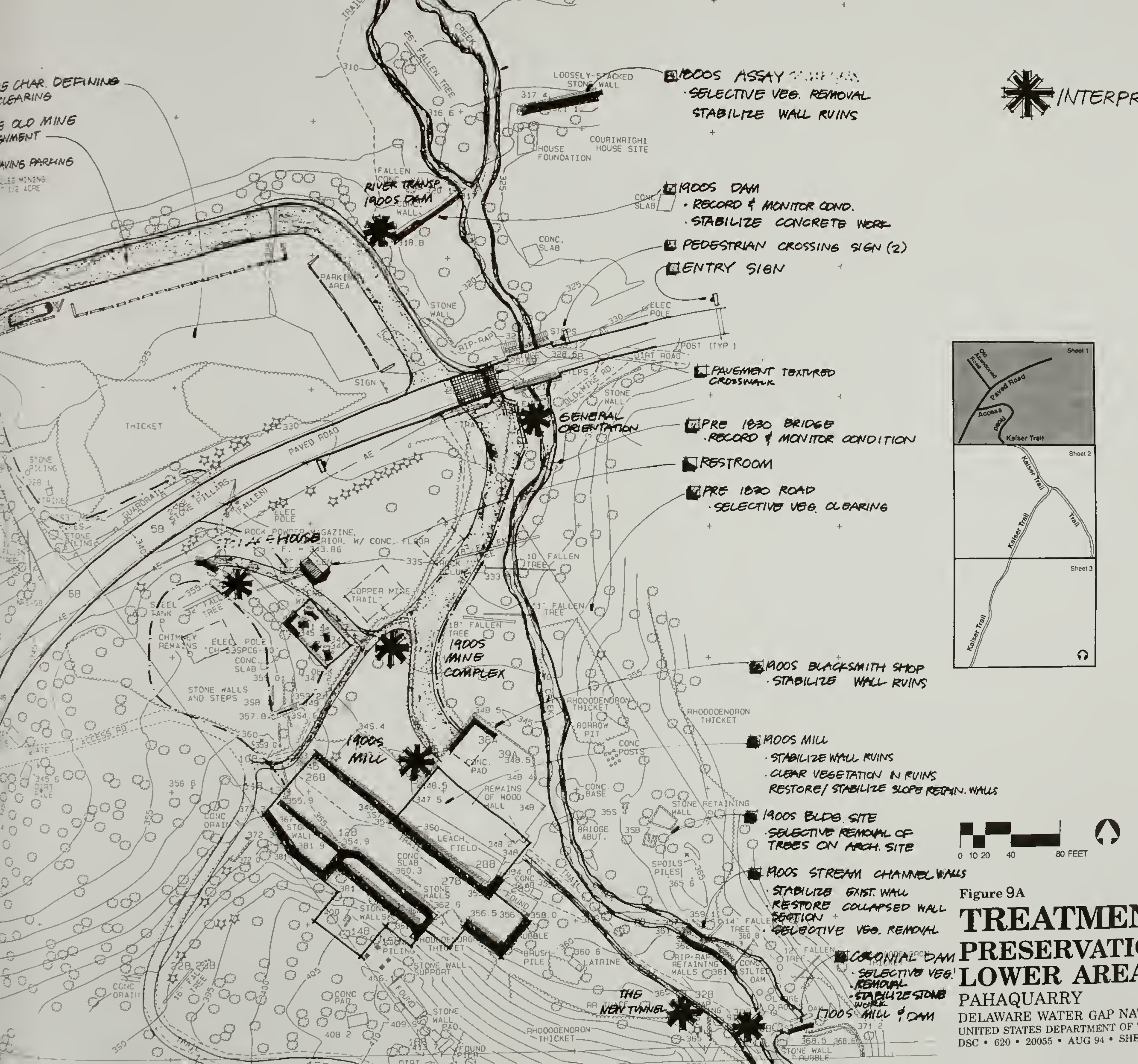

Figure 9A
TREATMENT ALTERNATIVES
PRESERVATION ALTERNATIVE 1
LOWER AREA

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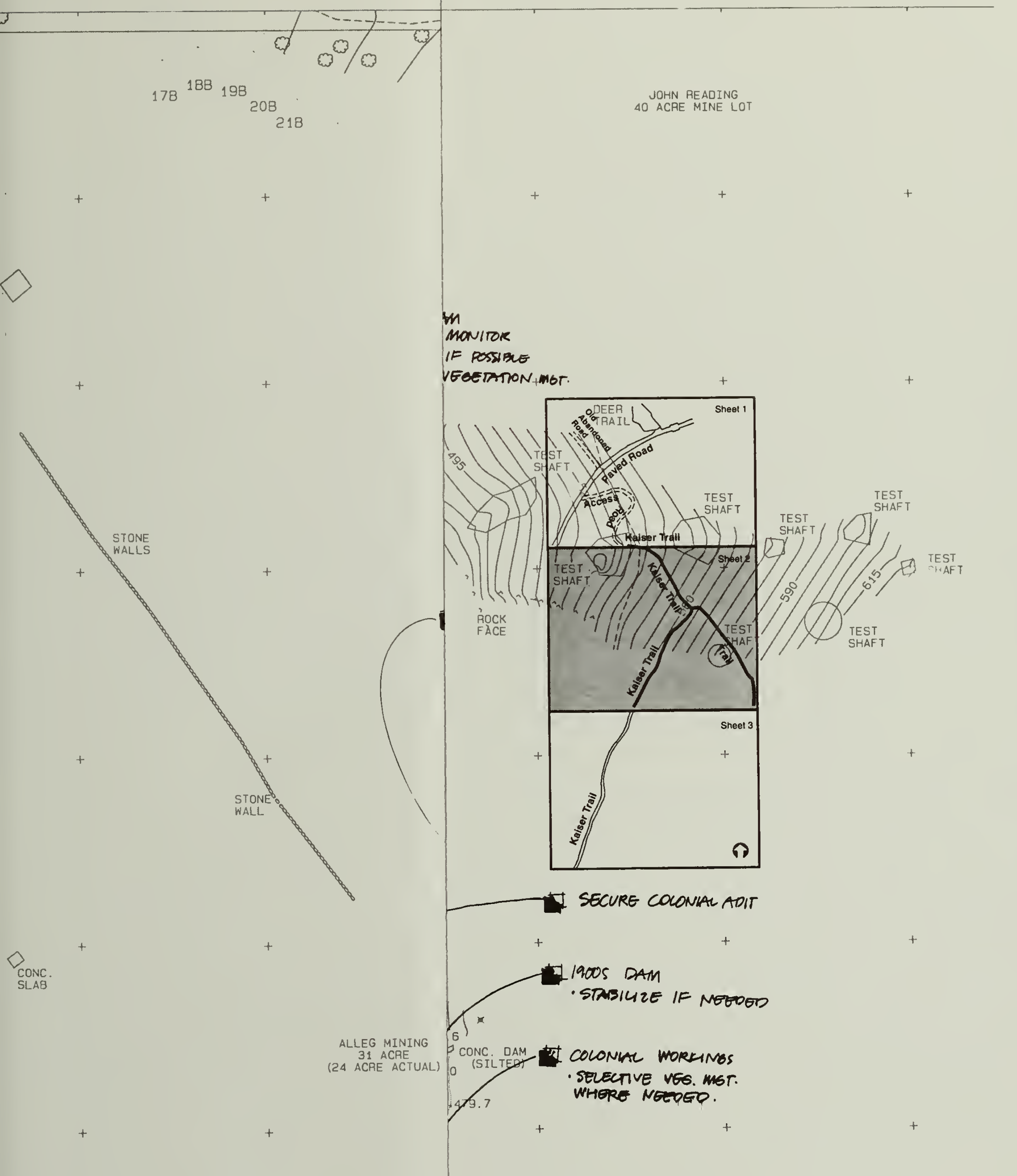

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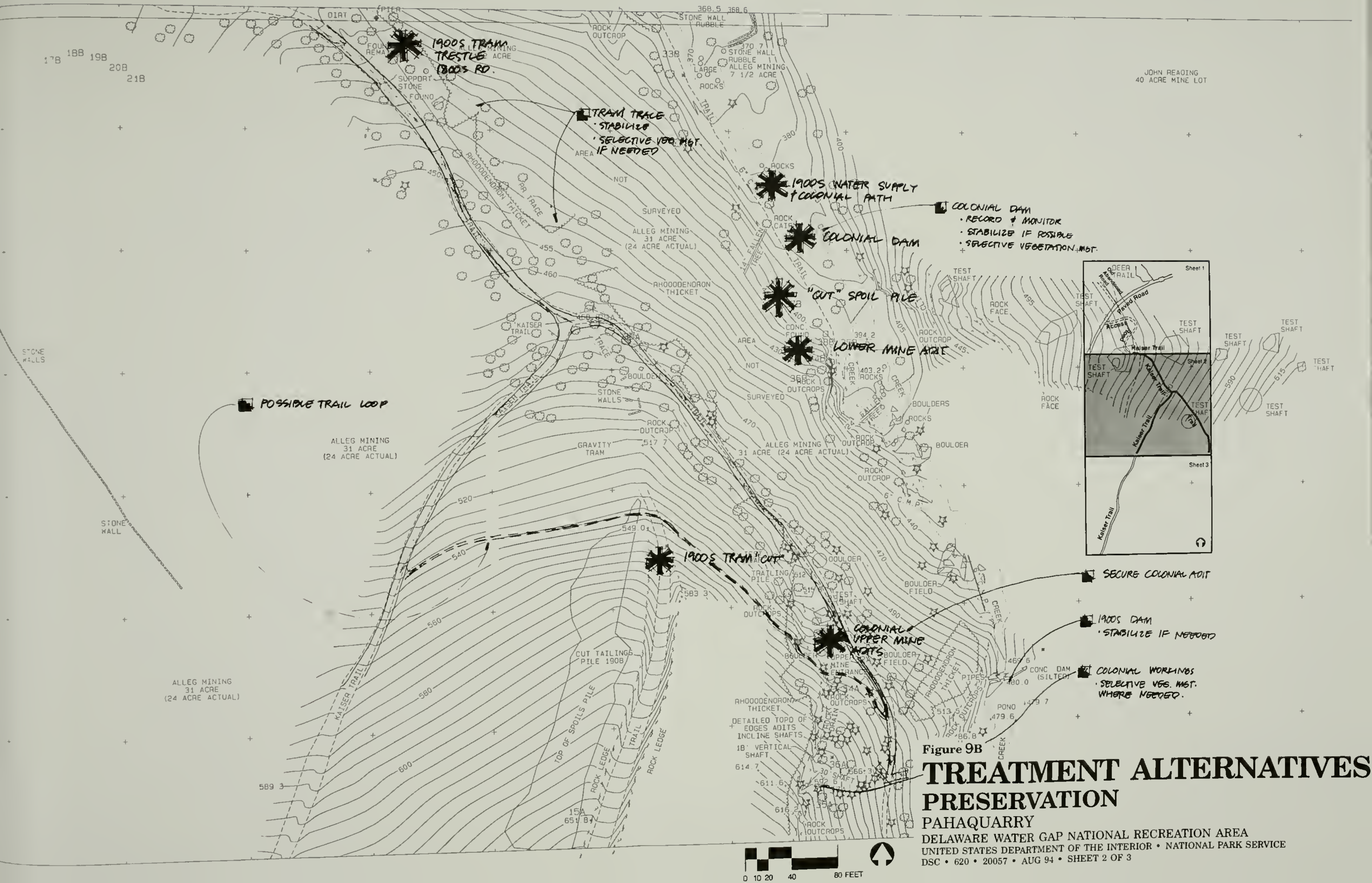

Figure 9B

TREATMENT ALTERNATIVES

PRESERVATION

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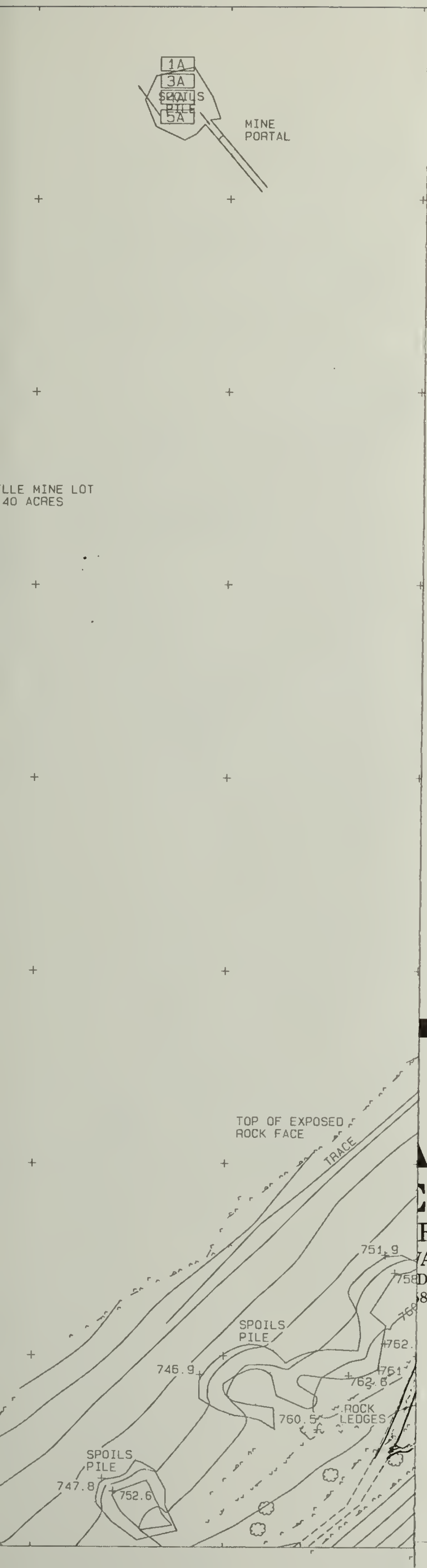

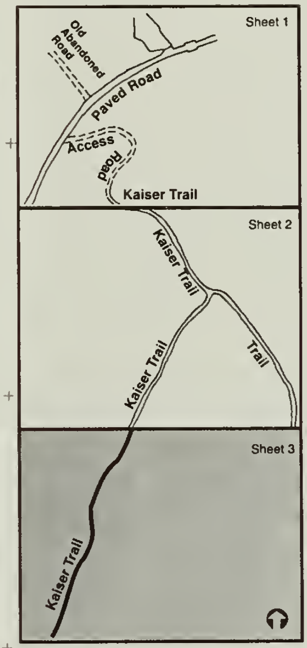

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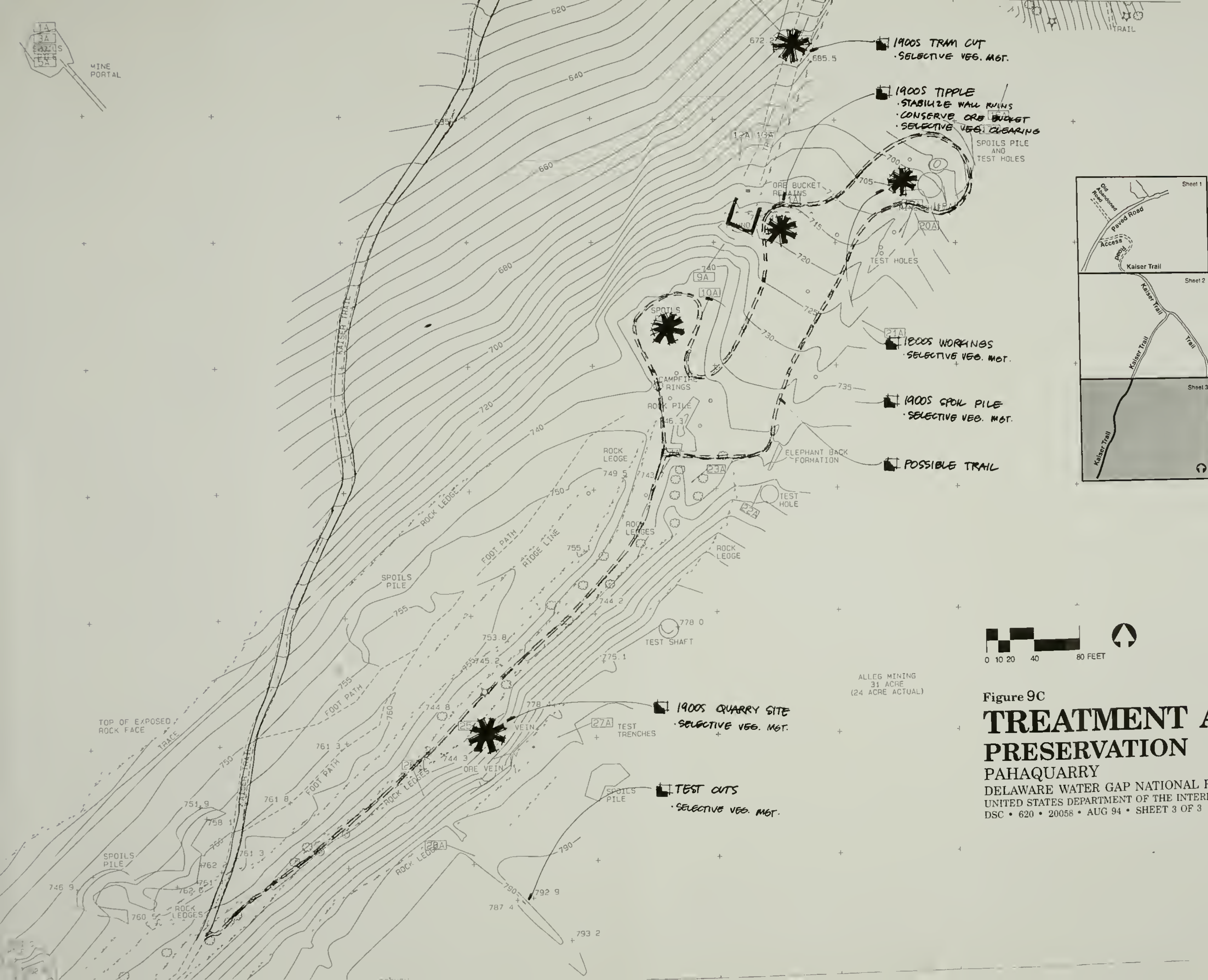

Figure 9C

TREATMENT ALTERNATIVES
PRESERVATION
PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

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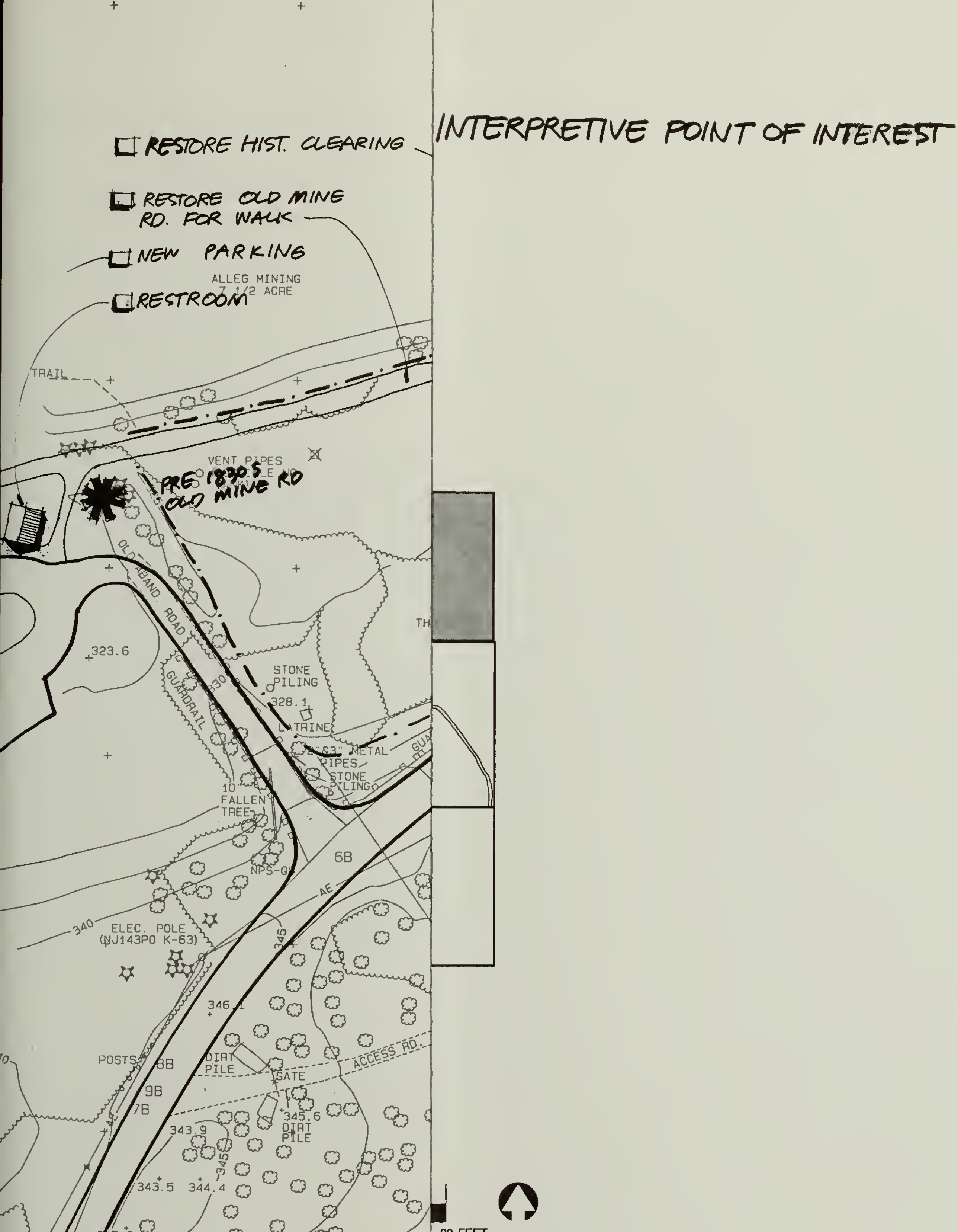

ATMENT ALTERNATIVES

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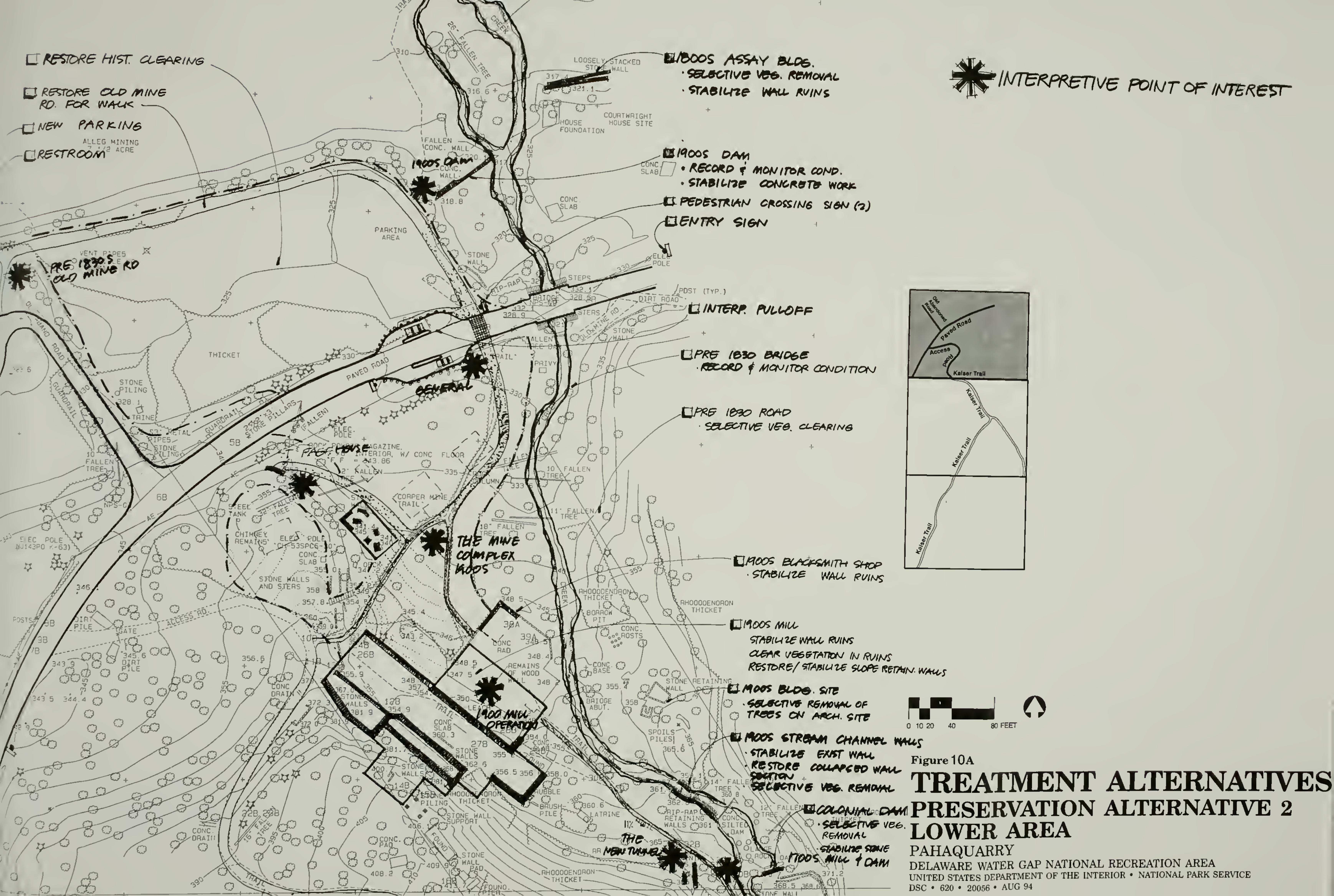

Figure 10A

TREATMENT ALTERNATIVES
PRESERVATION ALTERNATIVE 2
LOWER AREA

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PRESERVATION ALTERNATIVE 1

This preservation alternative, as shown on Figures 9A, 9B, and 9C, seeks, in addition to stabilizing and preserving significant landscape features, to restore missing features. It also presumes a more active interpretation of the site. This alternative proposes to restore part of the alignment of the pre-1936 "Old Mine Road" and provide parking off of this road. In the future it would be possible to restore more of this road alignment along the river to connect to the Copper Mine Inn. The parking stalls would be stabilized grass so that the historically cleared pasture, which would be restored, could approximate its original character. Other character-defining cleared areas would also be restored to the last mining period in the area around the 1900s mill ruins. This would remove the invasive exotic vegetation which has grown in these area.

The historic entry road to the mine complex and mill during the last mining period would also be restored and used for pedestrian access and interpretation of the mill complex site. The small road which accessed the historic oil house and ice house would also be restored for access and interpretation. The new restroom would be in the location of the former ice house. Stabilization and repair of threatened structural features would be the same as in the preservation alternative previously described.

Figures 9B and 9C identify stabilization treatments for structural features as well as possible interpretive loop trails to some of the mine exploration sites.

PRESERVATION ALTERNATIVE 2

Alternative 2, as shown on Figure 10A, is also a preservation treatment, however, the parking and restroom development is in an alternate location. In this alternative the parking is located off of the historic mining property in the former agricultural fields. The pre-1830 "Old Mine Road" would be restored and used for pedestrian access. The restroom would be convenient to the parking and beginning of the trail, however, it is located in the flood plain. An interpretive pullout would be provided along Old Mine Road to relate the story of the copper mining on the site. Other elements of the alternative are the same as shown on Figures 9B and 9C.

PARKING LOT OPTIONS

Figures 11, 12, 13, and 14 show alternative locations and configurations for the proposed parking which were considered.

Figure 11

TREATMENT ALTERNATIVES

PARKING LOT OPTIONS

PAHAQUARRY

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0 40 80 160 FEET

Figure 12

TREATMENT ALTERNATIVES

PARKING LOT OPTIONS

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

DSC • 620 • 20063 • SEP 94

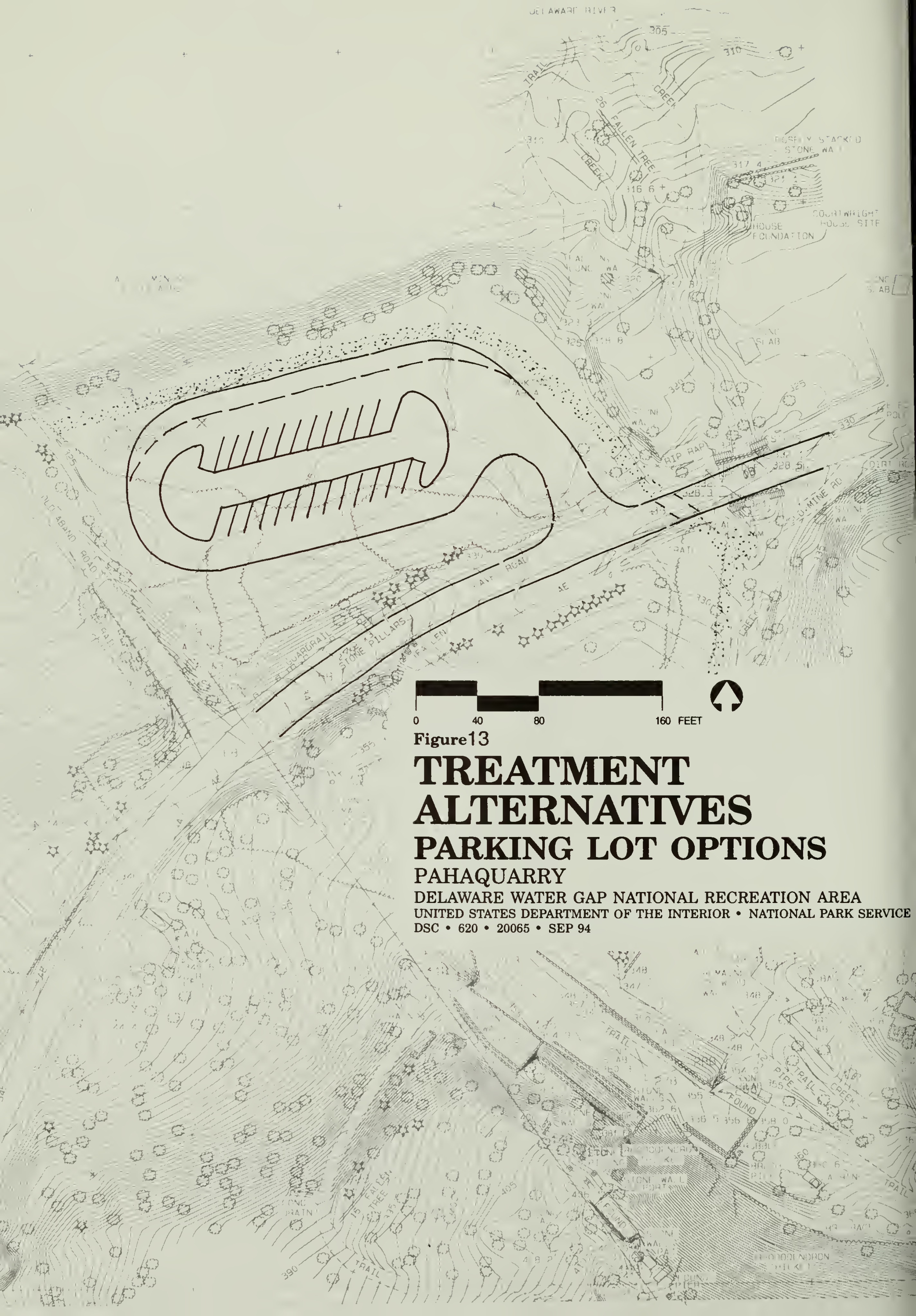


Figure 13

TREATMENT ALTERNATIVES

PARKING LOT OPTIONS

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

DSC • 620 • 20065 • SEP 94

Figure 14

TREATMENT ALTERNATIVES

PARKING LOT OPTIONS

PAHAQUARRY

DELAWARE WATER GAP NATIONAL RECREATION AREA

UNITED STATES DEPARTMENT OF THE INTERIOR • NATIONAL PARK SERVICE

DSC • 620 • 20061 • SEP 94

PREFERRED TREATMENT ALTERNATIVE

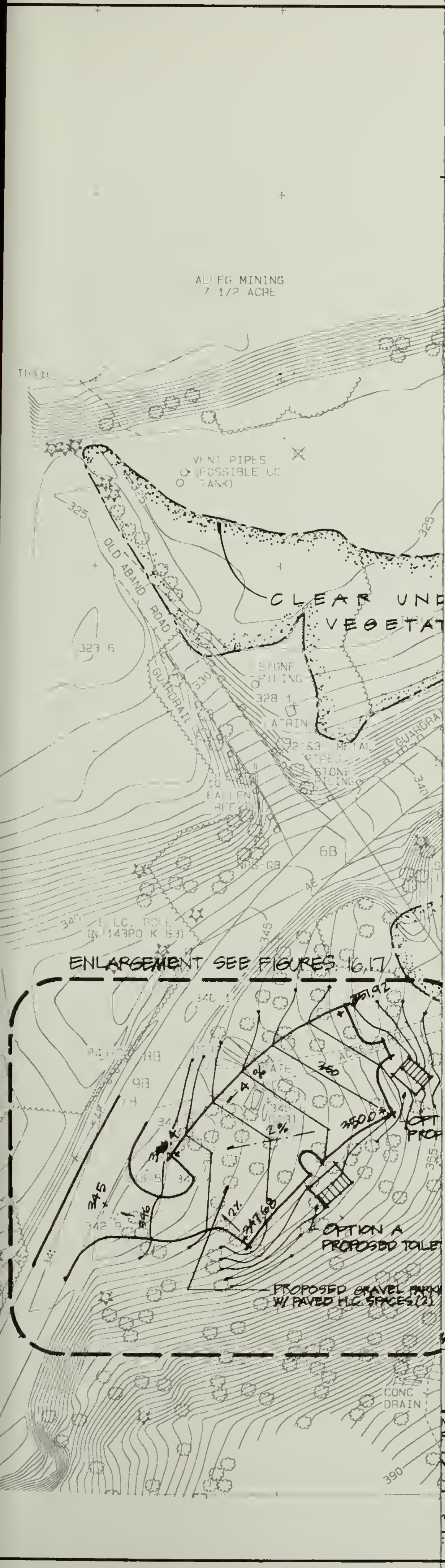
Figures 15, 16, and 17 illustrate the preferred treatment alternative. The preferred treatment alternative for the site recognizes the need to preserve character-defining vegetation clearings of the landscape, protect and stabilize structural ruins of the mining history, minimize visitor interpretation at this time, while using the site primarily as a trailhead for the Appalachian Trail. The recommended treatment closely follows the stabilization alternative identified earlier, however, it includes the vegetation clearing identified in the preservation alternatives.

In general, the preferred treatment attempts to arrest the threat to disintegration of the mining history remains by selective removal of vegetation. Vegetation growth, as identified in the existing conditions section of this report, has, along with natural weathering forces, caused deterioration of the structural integrity of many of the remains from the mining history. Historic photo 39, and Illustrations 24 and 25 show this threat. These photos show the portal of mine adit number two in the early 1900s, the early 1970s, and in 1993. The tree growing near the portal has apparently caused the left wall or slope of the portal to break up and be eroded out. Another example of the threat to the integrity of the ruins from vegetation can be seen by comparing Historic Photos 40 and 41 taken about 1950 with existing conditions shown in Figure 6A, photos 2, 3, 4, and 5. For structural remains of the mining periods, especially walls, vegetation, to varying degrees, tends to accelerate their fragmentation.

In addition to treatments identified on illustration 15, the upper colonial dam, and 1901 later Boy Scout rebuilt dam, would be stabilized by removing threatening vegetation and, for the 1901 dam, restoring damaged sections. Securing and stabilizing the openings of the lower and upper mine tunnels and incline shaft are also part of the recommended treatment. Steel bat gates will be constructed at the lower and upper mine tunnels and the incline shaft opening will also be secured. Stabilization of the lower mine tunnel for interior interpretive tours will not be pursued at this time due to stabilization, safety, maintenance, and staffing costs. A detailed study of the stabilization and security of the mine tunnels is covered in a separate report completed by the United States Bureau of Mines and included in Appendix H.

Development of the site, as shown in Figures 15, 16, and 17, is limited to a small twenty-five car gravel parking lot and composting toilet primarily for a trailhead to the Appalachian Trail. Revegetation with native planting would occur in the area disturbed by construction. An attempt would be made to save a maximum number of trees through sensitive grading and construction. The parking lot does not permit disabled access to the mill ruins. The restroom and the two handicap parking stalls would be made accessible. The two parking stalls would be paved for wheelchair access. If in the future, the mining site is to be more actively interpreted, disabled parking could be provided by returning the historic entry drive to the mill and using the historic drive and parking area between the mill and former barn. This would provide disabled access to the mill complex area for interpretation.

Figures 16 and 17 show two options which could work for development of the restrooms facilities. Further design refinement and selection of an option for the restroom will be done in subsequent design efforts.



1. REPOINT 20% 8'H × 65'L MASONRY WALL BACK & 17'-20'H × 65'L INSIDE
2. RESTORE 6'-12'H SECTION OF N. WALL END
3. REPOINT 100% OF WALL 12'-15'H × 60'
4. REPOINT 100% OF WALL 12'-15'H × 11'
5. RESTORE 20 S.F. DRY LAID STONE WALL
6. REPOINT 10% OF WALL 3'H × 80'
7. REPOINT 10% OF WALL 8'H × 80'
8. RESTORE 4 S.F. OF STONE SLAB BETWEEN WALLS
9. REPOINT 10% OF WALL 3'H BEHIND × 7 → VS 25×32
10. REPOINT 10% OF WALL 4'H × 30' RESTORE 30 S.F. WALL
11. RECONSTRUCT 20 S.F. OF MASONRY WALL 6
12. RESTORE 20 S.F. OF MASONRY WALL
13. REPOINT 100% OF WALL 8'H × 90'
14. REPOINT 10% OF WALL 8'H × 80'

BLACKSMITH SHOP

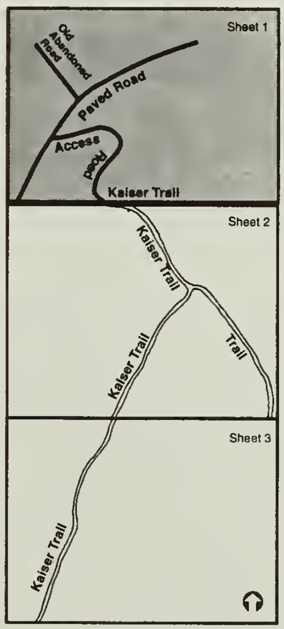
15. SPOT POINT FILL VOIDS & MISSING BLOCK & STONE IN WALLS 2-6'H × 44'
ASPHALT SEAL SLAB OVER FOUNDATION 20' FROM WALL 600 S.F.

EARTH SHELTER STORAGE BLDG.

16. CLEAR VEGETATION REMOVE 1 TREE
REPOINT 10 S.F. & SEAL VOIDS

GENERAL BLDG. REMAINS TREATMENT

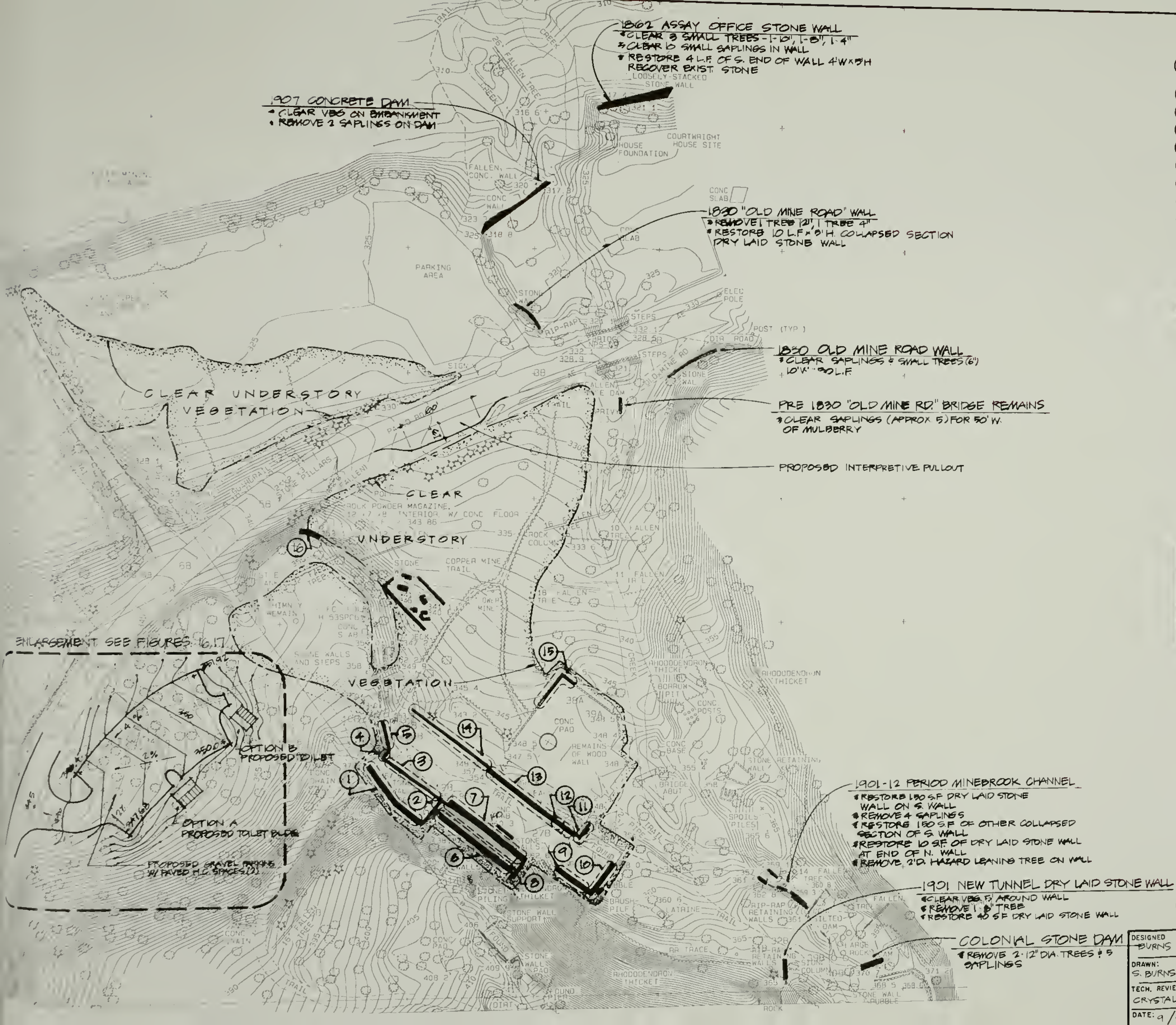
CLEAR ALL VEGETATION GROWTH ON ALL WALLS AND SLABS
RE PARGE TOPS OF ALL WALLS 673 L.F. × 1'-6"±



0 40 80 160 FEET

Figure 15

DESIGNED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
...RNS		PAHAQUARRY COPPER MINE	
...N: ...URNS		PREFERRED TREATMENT ALTERNATIVE	PKG. NO. 266 AB 35
REVIEW: ...STAL			SHEET . OF
...F 9/94			



1. REPOINT 20% 8'H × 65'L MASONRY WALL BACK & 17'-20'H × 65'L INSIDE
2. RESTORE 6'-12'H. SECTION OF N. WALL END
3. REPOINT 100% OF WALL 12'-15'H × 60'
4. REPOINT 100% OF WALL 12'-15'H × 11'
5. RESTORE 20 S.F DRY LAID STONE WALL
6. REPOINT 10% OF WALL 3'H × 80'
7. REPOINT 10% OF WALL 8'H × 80'
8. RESTORE 4 S.F. OF STONE SLAB BETWEEN WALLS
9. REPOINT 10% OF WALL 3'H BEHIND × 7 – VS 25×31
10. REPOINT 10% OF WALL 4'H × 30 RESTORE 20 S.F. WA..
11. RECONSTRUCT 20 S.F. OF MASONRY WAL. 6 –
12. RESTORE 20 S.F. OF MASONRY WA..
13. REPOINT 100% OF WALL 8'H × 90'
14. REPOINT 10% OF WALL 8'H × 80

BLACKSMITH SHOP

15. SPOT POINT FILL VOIDS & MISSING BLOCK & STONE IN WALLS 2-6'H × 44'
ASPHALT SEAL SLAB OVER FOUNDATION 20' FROM WALL 600 S.F.

EARTH SHELTER STORAGE BLDG.

16. CLEAR VEGETATION REMOVE 1 TREE
REPOINT 10 S.F & SEAL VOIDS

GENERAL BLDG. REMAINS TREATMENT

CLEAR ALL VEGETATION GROWTH ON ALL WALLS AND SLABS
RE PARGE TOPS OF ALL WALLS 673 L.F × 1'-6"I

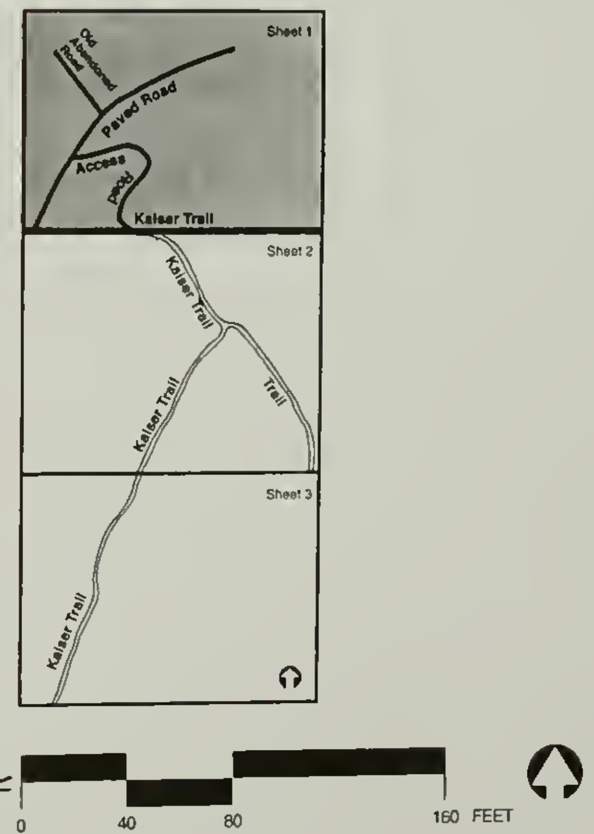
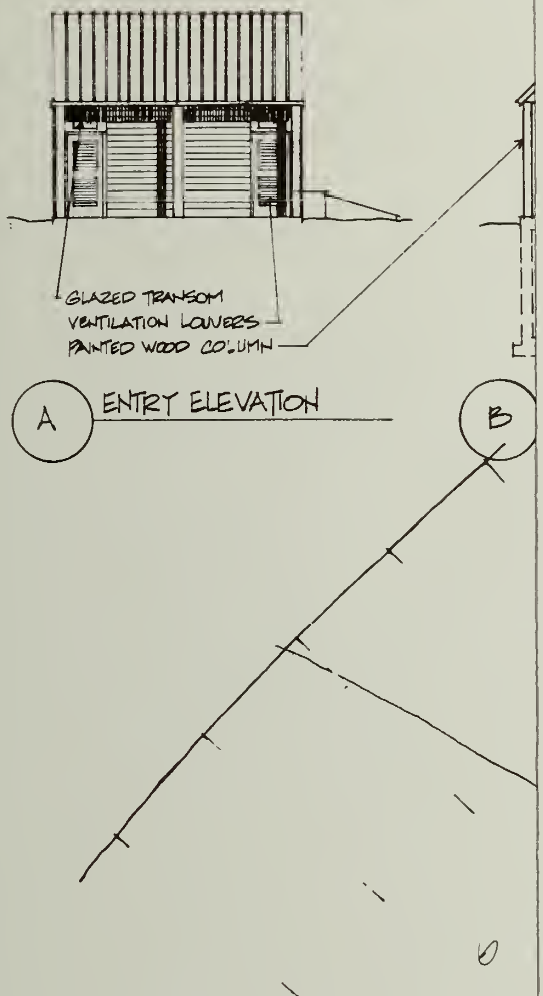


Figure 15

DESIGNED	SUB SHEET NO	TITLE OF SHEET	DRAWING NO.
BURNS		PAHAQUARRY COPPER MINE	
DRAWN: S. BURNS		PREFERRED TREATMENT ALTERNATIVE	PKG. NO. 266
TECH. REVIEW: CRYSTAL			AB 33
DATE: 9/94			SHEET . OF



8 16 32 FEET

Figure 16

ED:	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
ONNELL		PREFERRED TREATMENT ALTERNATIVE PAHAQUARRY COPPER MINE	DSC 620 / 20068
: ONNELL			PKG. NO. 264 AB 35
REVIEW: NS		Composting Toilet Option A	SHEET ___ OF ___
8/94			

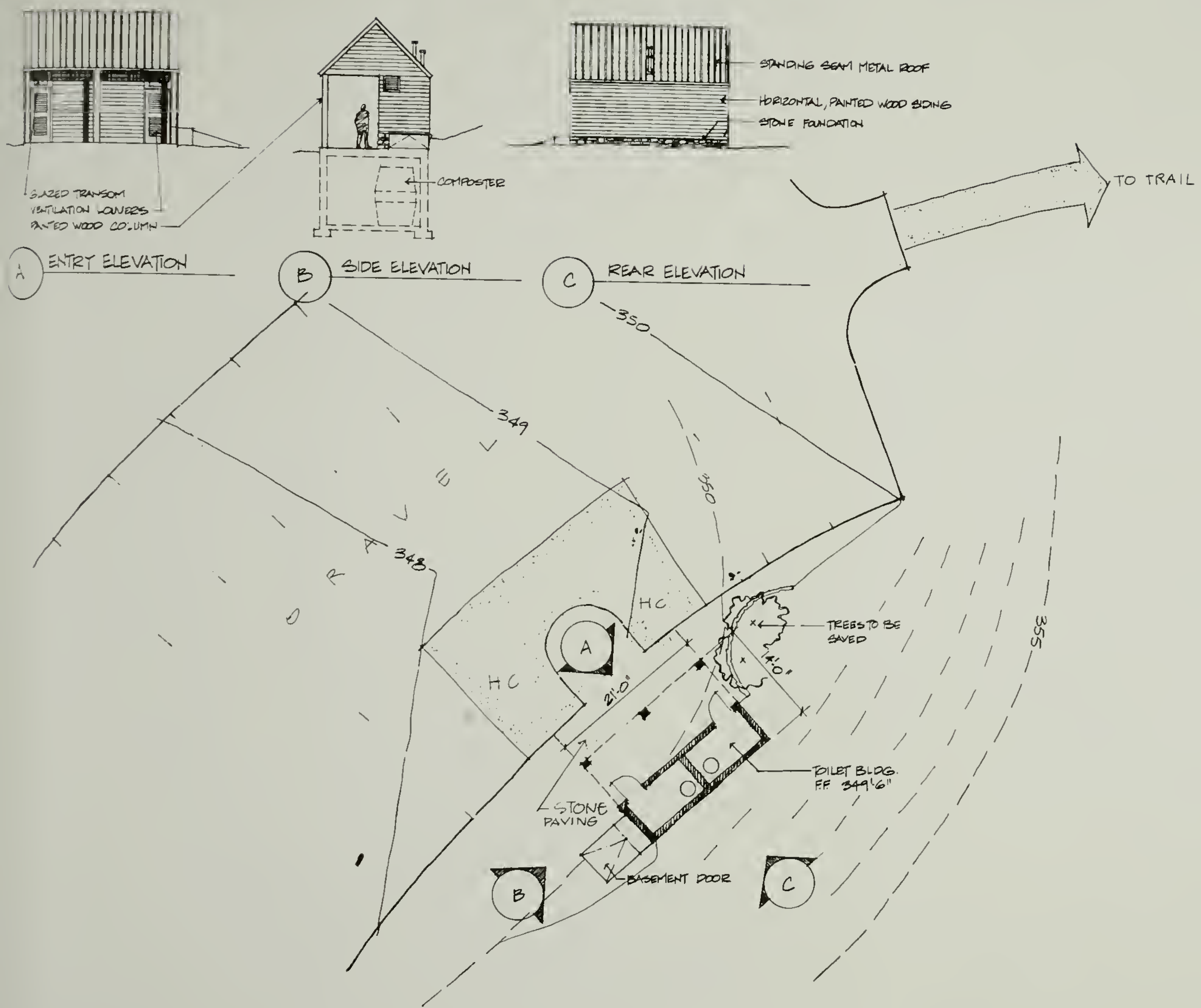


Figure 16

DESIGNED	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
McCONNELL		PREFERRED TREATMENT ALTERNATIVE	DSC 620 20068
DRAWN: McCONNELL		PAHAQUARRY COPPER MINE	PKG. NO. 264 AB 35
TECH. REVIEW: EVANS		Composting Toilet Option A	SHEET
DATE: 8/94			OF

Figure 17

ED: ONNELL / ONNELL / REVIEW: NS / 8/94	SUB SHEET NO.	TITLE OF SHEET	DRAWING NO.
ED: ONNELL		PREFERRED TREATMENT ALTERNATIVE PAHAQUARRY COPPER MINE	DSC 620 / 2009
ONNELL		Composting Toilet Option B	PKG. NO. 264 / AB / 35
REVIEW: NS			SHEET
8/94			OF

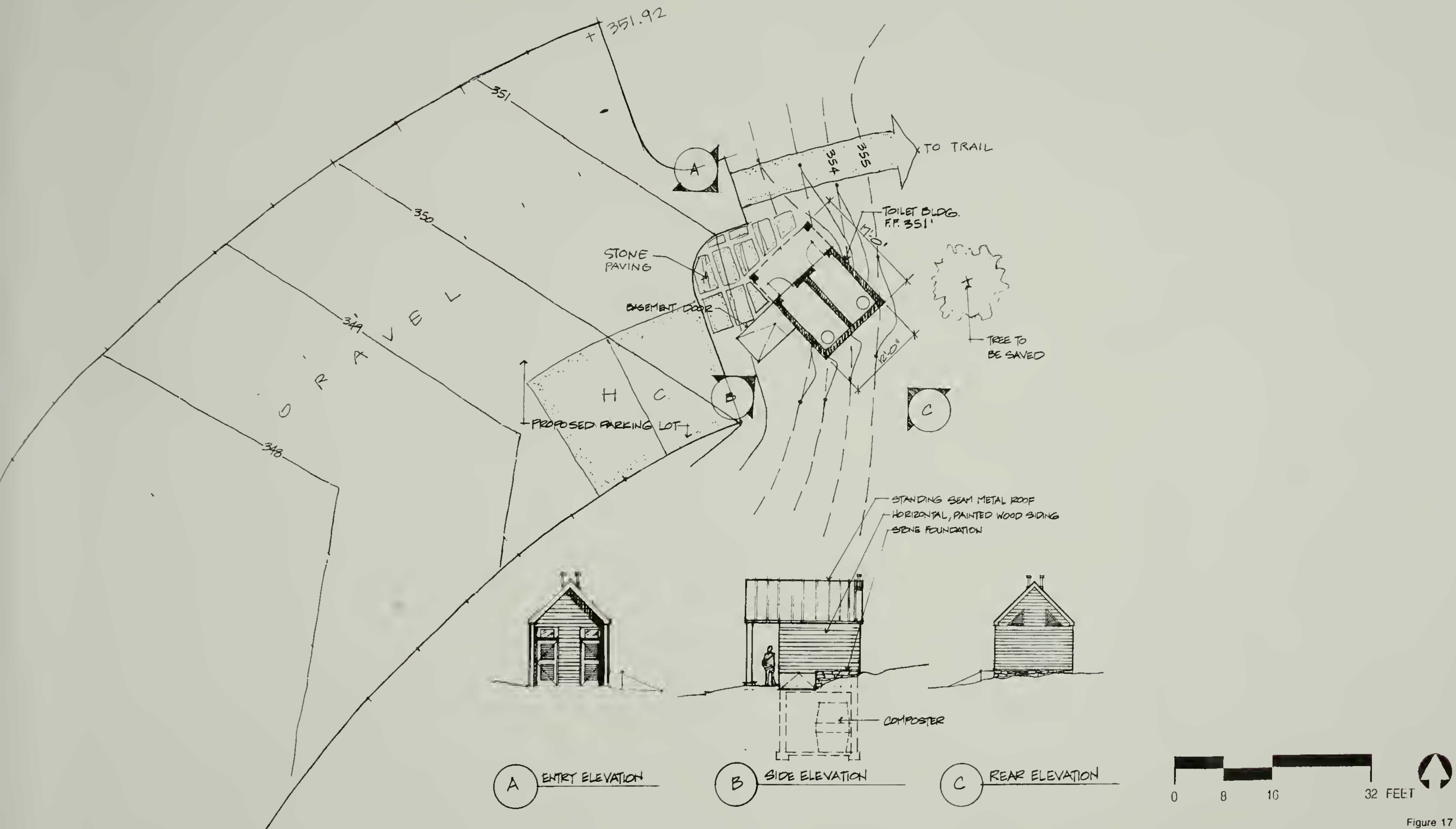


Figure 17

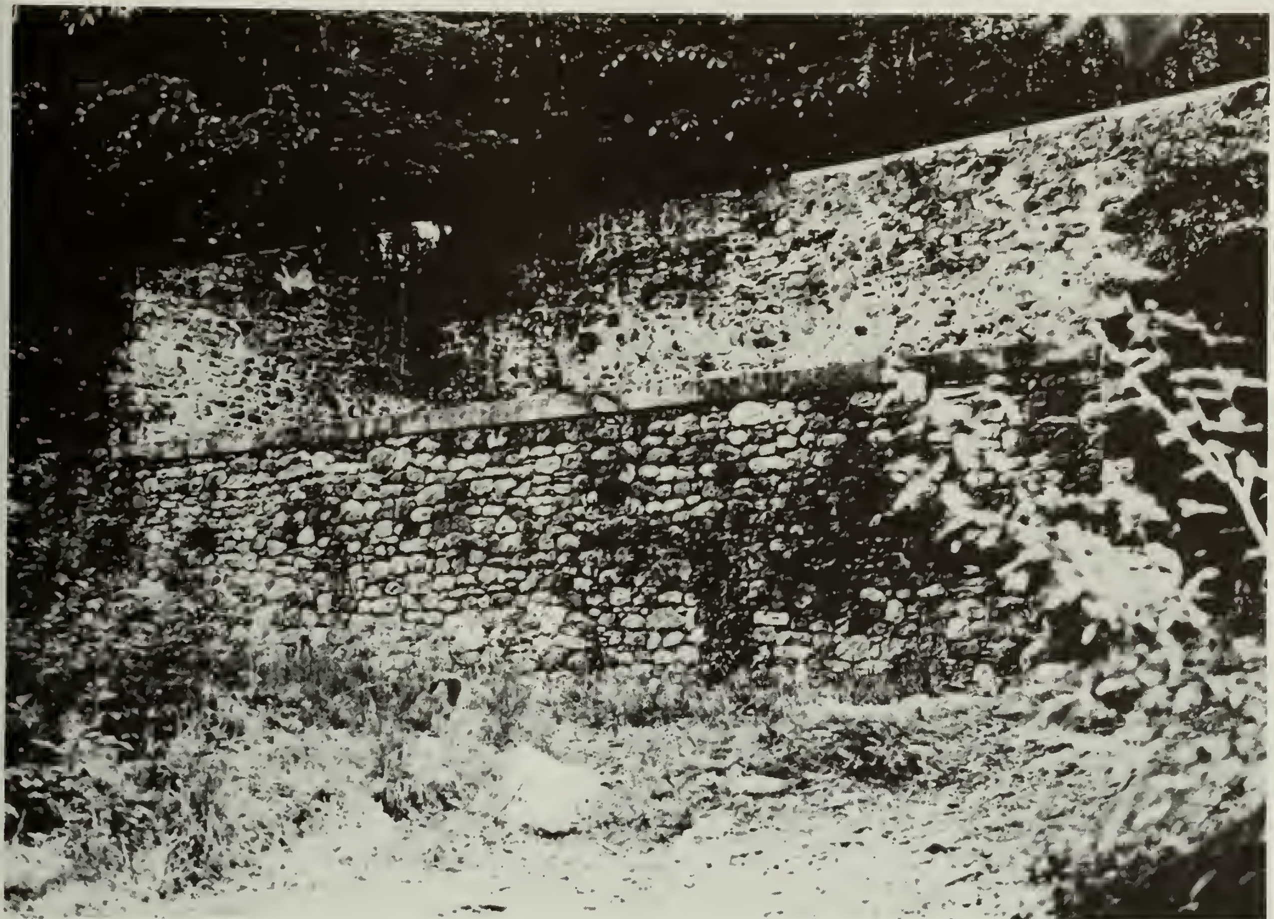
DESIGNED: McCONNELL	SUB SHEET NO	TITLE OF SHEET	DRAWING NO
DRAWN: McCONNELL		PREFERRED TREATMENT ALTERNATIVE	DSC 620 / 2009
TECH. REVIEW: EVANS		PAHAQUARRY COPPER MINE	PKG. NO. 264 AB 35
DATE: 8/94		Composting Toilet Option B	SHEET ___ OF ___

Historic Photo 39: Entrance to Adit Number 2 in the Early 1900s
Courtesy of Don Pace, Easton, Pennsylvania

Illustration 24: Entrance to Adit Number 2 in the Early 1970s
Courtesy of Don Pace, Easton, Pennsylvania

Illustration 25: Entrance to Adit Number 2 in 1993
Photo by NPS Survey Crew

Historic Photo 40: Mill Ruins Ca. 1950
From C. H. Vivian, "Mystery of Pahaquarry Copper," *Compressed Air Magazine*, March 1951
Mills ruins before an overgrowth of vegetation.



Historic Photo 41: Remains of the Central Part of the Mill Ca. 1950
From C. H. Vivian, "The Mystery of Pahaquarry Copper," *Compressed Air Magazine*, March 1951
Northwest wall of the mill before overgrowth of vegetation.

ARCHEOLOGICAL RECOMMENDATIONS

Mining sites represent special purpose byproducts of the Industrial Age (Hardesty 1988). As a form of a resource extraction site, mining resources are part of the larger settlement pattern and reflect the type(s) of exploitation strategies implemented by past and present cultural groups. As new technologies are developed, the distribution of special purpose resources extraction sites across the landscape is altered, as well as the overall settlement pattern. The original landscape is transformed into a cultural landscape representing a stratified political economy.

The concept of a "feature system" was developed by Hardesty (1988) in order to describe remains of mining sites. This feature system is "a group of archaeologically visible features and objects that is the product of a specific human activity. Identification of the system begins with documentary accounts of the morphology and activities of mining" (Hardesty 1988:9).

The feature system has several dimensions which make it a useful analytical tool. First, the system is a spatial dimension, which includes remains dispersed over a large geographical area. Secondly, the system includes a temporal dimension, which takes the form of changes in the feature system due to developments in technology. And third, different types of feature systems can be identified often at the same site; examples of these being the industrial technology feature system and the household feature system (Hardesty 1988:10-13).

Archeological investigations at the Pahaquarry copper mine Site may address both general and specific research questions utilizing the feature system model. Under the spatial dimension element, the mine site grew from approximately 266 acres of land during the first mining operation of the mid-eighteenth century to approximately 2,000 acres during the early twentieth century mining operation. Evidence of physical characteristics should be present. Visible remains on these sites include tailing piles, shafts, mine entries, equipment pads, support facilities (mining offices, mills, privies, trash dumps, and roads). The second element, temporal dimension, applies to this site, as distinct mining periods are documented. Each period carries with it a change in mining operation with the implementation of new technologies of mining and milling. Archeological investigations may support the historical documentation to each mining operation in terms of processing areas and reuse of earlier systems or scavenging of recyclable components. Additional archeological research may help address questions concerning mine workers daily living conditions, ethniticity, consumer behavior, social status or class, household size and organization and political status during each mining episode.

Traditionally, many mining sites are formed through sequential episodes of occupation and abandonment, thus earlier occupations tend to be destroyed. However, at the Pahaquarry copper mine Site, the eighteenth and nineteenth century mining operations may not have been totally destroyed by the twentieth century operation and may contain enough integrity to address these research questions.

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Interview of John Niper, Hackettstown, New Jersey by Berle Clemensen, April 17, 1993.

Interview of Leonard Rue, Jr. Blairsville, New Jersey by Berle Clemensen, April 20, 1993.

Interview of John Deshler, Bangor, Pennsylvania by Berle Clemensen, July 12, 1993.

Letter

Daniel W. Earle, Scout Executive, to J. H. Hedges, United States Bureau of Mines, October 16, 1950.

APPENDIXES

APPENDIX A

CHRONOLOGY OF THE COPPER EXPLORATION SITE AT PAHAQUARRY

1686, June 6	John Reading, Jr. was born in Gloucester, New Jersey. His father, John, Sr., was one of wealthiest men in New Jersey and well connected with the Proprietary and later royal government of the colony.
1719	While traveling with a party through what became Sussex county to survey the New Jersey/New York boundary, John Reading, Jr. found some stones that looked promising for iron ore.
1720, Nov. 5	John Reading, Jr. married Mary Ryerson.
1721, March 28	John Reading, Jr. accepted a seat on the New Jersey Proprietary Council. This position gave him political connection from which he could expand his economic base.
1722, May 23	John Reading, Jr. received a warrant from the New Jersey council that allowed him to choose 555 acres of unsurveyed land in the western division of New Jersey.
1741	Iron ore discovered in Oxford township of what became Warren county, New Jersey. A smelter was established there by 1743 at Oxford Furnace. John Reading, Jr. had no role in this operation although he became interested in area iron mining soon after this event.
1740s	John Reading, Jr. purchased 702 acres of land in Oxford township for ore, wood, water, and other conveniences "suitable for Iron Works." He also bought 200 acres of land near the head of Merril's Brook on Scotts Mountain in Oxford township which had wood suitable for making charcoal.
1753, May 24	John Reading, Jr. used part of his 1722 warrant for 555 acres to obtain forty acres of land in what became Pahaquarry township of Warren County. Copper was found on this property. Reading entered into partnership with Martin Ryerson, his brother-in-law, and Anthony Maxwell to exploit the copper. Reading split the forty acres with his partners. It was probably Maxwell who found the copper deposit because he owned seventy-one acres about 1.5 miles north of the mine site. Five prospect holes are present on this property nearly atop the hillside along Mine Brook opposite adit 1.
1754, Feb. 6	John Reading, Jr. and Samuel Johnson obtain 200 acres of land adjacent to the forty acres on the northeast. It contained part of the

	copper-bearing sandstone outcrop. This land was split with Ryerson and Maxwell as well.
1754	Anthony Maxwell obtained two acres of land on the Delaware River "a little to the northwestward" of the original forty acres. It measured ten rods on the river front and ran eight chains and ten links back from the river on parallel lines. Maxwell split the land with Ryerson and Reading. It was on this land that Maxwell resided and buildings were constructed for use by those "concerned in the affair of mining."
1755, Aug. 20	Reading obtained an interest in twenty-four acres from Martin Ryerson which adjoined the original forty acres on the southwest. Martin Ryerson purchased this land on Feb. 10, 1755 from Samuel Neville. It formed part of a 255-tract owned by Neville. Most of the prospecting activity occurred on this acreage.
1761, Jan. 21	John Reading, Jr. deeded his interest in the mining property to his children.
1767, August	John Reading, Jr's. son Richard advertised his interest in the mining property for sale. Richard soon thereafter moved to Canada where he was murdered.
1767, Nov. 5	John Reading, Jr. died. His wife Mary died April 17, 1774.
1767	The four parcels that included the forty acres, twenty-four acres, two acres, and 200 acres, in which John Reading, Jr. had an interest, stayed in the Reading family. Ownership ultimately fell to Joseph, Mary, and Anna Reading who were his grandchildren.
Ca. 1768	Samuel Johnson purchased the remainder of the 255 acres that comprised the Samuel Neville land along with a 40 acre tract identified as the Neville Lot and a 350 acre parcel, originally surveyed to Richard Salter, that surrounded the Neville Lot. He also obtained 118 acres that had been surveyed to Richard Salter in 1755.
Ca. 1780s	Samuel Johnson sold the above land to William Diltz.
1792, Oct. 2	William Diltz bought the 532-acre Richard Salter tract from Salter's heir and son John.
1811, May 1	William Diltz sold the 350 acre and 118 acre parcels to John Johnson, David H. Bishop, and James Van Kirk.
1822, Jan. 1	Joseph Reading, Mary Reading, and Anna Reading sold a half interest in their four tracts to Thomas Gordon, a Trenton lawyer. Gordon at one time had been William Shippen's attorney. Shippen had owned the iron mines and smelter at Oxford Furnace.

1829, Dec. 21	Joseph Reading and Thomas Gordon granted three parcels, the forty acre, twenty-four acre, and two acre tracts, to Henry Miller, David Bruce, and David Kirkendal and their heirs for 999 years. This grant was for the purpose of digging, searching, and exploring for copper and other valuable minerals. Reading and Gordon were to get ten percent of any copper or other minerals extracted during mining. The grant carried a proviso that if Miller, Bruce, and Kirkendal or their heirs did not discover or produce any ore from a mine or mines during the first five successive years of the grant or any five successive years during the term of the grant, then the grant would be void. When the three men were not successful in a search for copper, the grant was nullified by the end of 1834.
Ca. 1830s	Nathaniel Saxton bought the remainder of the Diltz property that included the 532 acre Richard Salter land, the remainder of the 255 acre Neville tract, and the forty acre Neville Lot.
1834, Sept. 1	Joseph Reading, Thomas Gordon, Charles Stewart, and Robert Stewart sold one of four parcels, the 200 acre plot, to Moses Van Campen. Samuel Van Gordon purchased five acres of that tract from Van Campen.
1839	Henry Rogers, New Jersey State Geologist, visited the mine site and wrote that at an early period two or three excavations had been made in search of copper ore. He found the mine holes to be obstructed by rubbish.
1840	John Jordan, a Philadelphia mining engineer, visited the mine site and reported that he found two "horizontal shafts" that were fifty to 100 feet long. These shafts were, no doubt, adits 1 and 2.
1845, April 1	Thomas Gordon, Joseph Reading, and Anna Reading sold the remaining three parcels, the forty acre, twenty-four acre, and two acre plots, as one tract of seventy-one acres to Andrew Ribble.
1845, Aug. 5	Andrew Ribble sold the seventy-one acres to Charles Bartles of Flemington, New Jersey. Forty acres of this property was land originally owned by John Reading, Jr. and was adjacent to the 195 acres of land owned by Moses Van Campen. Bartles was a wealthy lawyer who had investments in several mines including a copper mine at Flemington and several lead mines in Missouri about fifty miles from St. Louis. He also invested in railroads and various land ventures.
1846, Sept. 2	Peter I. Clark of Flemington, New Jersey, a friend of Charles Bartles, obtained Nathaniel Saxton's three tracts of land at a sheriff's auction.

1846, Sept. 5	James N. Reading, friend of Bartles and Clark, bought Moses Van Campen's 195 acre tract which had been part of the original 200 acre Reading/Johnson land.
1847, Feb. 26	Peter I. Clark, Charles Bartles, James N. Reading, James Hunt, Alexander V. Bonnell, and William P. Clark form the Alleghany Mining Company. James N. Reading was company president and Charles Bartles was company treasurer. Capital stock was 200,000 shares at $20.00 per share.
1847, March	Beginning in March 1847 and through June 10, 1848, Charles Bartles sold stock in the Alleghany Mining Company.
1847, April	Samuel Shoemaker sold 33.75 acres of land to James Hunt.
1847, April	Mining seems to have begun after April 10 and the first payroll was May 6, 1847. Ten men were employed in Mining at this period plus three blacksmiths, one person paid for sharpening tools, and two wood cutters. James Hunt was overseer at this time until he resigned on May 8, 1847. I. A. Sheaff then became the mine superintendent.
1847, April	Three kegs of blasting powder purchased as well as an anvil and bellows. A keg of black powder usually weighed twenty-five pounds.
1847, May 5	James Hunt sold the 33.75 acres to Charles Bartles just before he left the company.
1847, May 6	Reading and Bartles, acting for the company, borrowed $3,000 from the Merchants and Manufacturers Bank of Trenton, New Jersey.
1847, May 7	Peter I. Clark sold 188.7 acres of his 1271 acres to the Alleghany Mining Company.
1847, May 7	Charles Bartles sold eleven of his seventy-one acres of land to the Alleghany Mining Company.
1847, May 8	James Hunt resigned as a company director.
1847, May 19	Alleghany Mining Company bought 7.5 acres of land from Moses Shoemaker that fronted on the Delaware River.
1847, May	Payroll records missing for May and June, but mining does occur.
1847, June	One keg of powder purchased June 15 and two kegs of powder bought on June 29.
1847, June 24	Directors of the Alleghany Mining Company wrote a proposal for the construction of a 18 x 32 feet two-story plus attic dwelling house

with an attached 12 x 18 feet kitchen. The attic served as an office and, judging from the chemicals purchased by the company, also functioned as an assay office. Jonas Kintner agreed to build the house for $500 and the kitchen for $230. He was to have the house built by October 31, 1847. Final payment was made to Kintner on March 18, 1848. No location was given for the building. At some point a barn was evidently built near the dwelling house.

1847, July	Twenty men employed in mining.
1847, July	John Mickle paid between July 7 and August 1, 1847 for fifty-six days of hauling ore to Flemington.
1847, July	A wheelbarrow purchased.
1847, Aug.	Fourteen men employed in mining.
1847, Aug. 2	Eight cast steel drills purchased in Flemington.
1847, Aug 5	Two kegs of powder bought.
1847, Aug. 25	Thomas Dowling paid for 6.5-foot excavation in an adit.
1847, Aug. 31	Thomas Dowling paid for 8.5-foot excavation in an adit.
1847, Sept.	Twenty men employed in mining.
1847, Sept. 8	Thomas Dowling paid for ten-foot excavation in an adit.
1847, Sept. 18	Twenty-five casks purchased for packing ore.
1847, Sept. 19	Thomas Dowling paid for twenty-foot excavation in an adit.
1847, Oct.	Twenty men employed in mining.
1847, Nov.	Ten men employed in mining.
1847, Nov.	Two kegs of powder purchased.
1847, Dec.	Ten men employed in mining plus John Courtright paid for 10.5 days "burning coal pit."
1847, Dec.	Three kegs of powder purchased.
1848, Jan.	Nine men employed in mining.
1848, Jan.	Two kegs of powder purchased.
1848, Feb.	Two kegs of powder purchased. No payroll exists.

1848, March 20	I. A. Sheaff paid $800.00 as a half year salary.
1848, March	No payroll exists. The end of March seems to be the end of mining for the Alleghany Mining Company in the 1847-48 period.
1849, April 17	James N. Reading, president, sells some of his stock in the Alleghany Mining Company.
1852, May 17	Henry Shoemaker wrote to Charles Bartles and stated that he had not seen him or heard from any company official in some time. He asks what they intend to do with the house he then occupied.
1860, Nov. 21	Peter I. Clark answers a letter written to him by Jesse Godley from Philadelphia. Godley inquired about the Alleghany Mining Company.
1860, Dec. 27	Peter I. Clark answers another of Godley's letters and stated that the Alleghany land consisted of 488 acres.
1861, Sept.	Bartles, Clark, and Reading sell the Alleghany Mining Company to Jesse Godley, William Godley, Stacy B. Bancroft, Joshua M. Butler, Marmaduke Moore, Charles P. Baynard, Henry Godley, and George H. Hart.
1861, Sept. 19	Charles Bartles sold his seventy-one acres to the Alleghany Mining Company new owners. Part of this tract had been sold to the Alleghany Mining Company in 1847.
1861, Sept. 19	Peter I. Clark sold his 1,271 acres to the Alleghany Mining Company new owners. It consisted of the following: Lot 1 - 532 acres originally surveyed to Richard Salter on November 5, 1755. Lot 2 - remainder of the 255 acres originally surveyed to Samuel Neville in 1753. Lot 3 - Forty acres originally surveyed to John Reading, Jr. in 1753. Lot 4 - 350 acres that surrounded the Neville forty acre lot. Lot 5 - 118 acres originally surveyed to Richard Salter in 1755.
1861, Oct. 13	New Alleghany Mining Company owners purchase 33.75 acres from John V. Shoemaker. Charles Bartles had sold this land to Shoemaker in 1858.
1861, Oct.	New Alleghany Mining Company owners contract with Montroville Wilson Dickeson to produce a geological survey of the company land as part of a promotional booklet.

1861, Dec. 5	James N. Reading sold 195 acres to the Alleghany Mining Company new owners. This 195 acres was from the 200 acres surveyed originally to John Reading, Jr. and Samuel Johnson in 1754.
1861, Dec. 20	Dickeson completed his geological survey which the company printed toward the end of May 1862 with other material. He described 14 adits, inclined shafts, and prospect holes.
1862, March 24	The Alleghany Mining Company reorganized with an increase in lands and capital.
1862, Ca. Dec.	The Alleghany Mining Company ceases operation and did not renew mining.
1867, April 3	The Alleghany Mining Company sold its land to Aaron Keyser of Warren county, New Jersey, but retained the mineral rights. Keyser operated a tannery in Knowlton Township of Warren County and purchased the land to obtain oak and hemlock bark for his concern. He probably cut timber on the land as well.
1868	George H. Cook, the New Jersey State Geologist, visited the mines and noted that no work had been done there since 1862. He wrote that there were several points along the ravine where mining had been done. One adit (number 1) ran for about 150 feet on a southwest trend and then turned northwest.
1875, June 10	Aaron Keyser sold 33.75 acres to Oliver Courtright. This land fronted on the Delaware River just upstream from Mine Brook.
Ca. 1890s	The Alleghany Mining Company repossessed the land after Aaron Keyser abandoned it.
1901, March 9	Phillip Godley, now majority stockholder in the Alleghany Mining Company entered into a one-year agreement with Henry D. Deshler of the Montgomery Gold Leaf Mining Company which permitted Deshler to search for ore of all kinds and to mine it, as well as construct buildings beginning April 1, 1901.
1901	Deshler hired men and began to mine ore from a new adit, which by December 1901 had yielded 100 tons of low grade ore.
1901, Dec. 17	Oliver Courtright sold 33.75 acres of land to the Montgomery Gold Leaf Mining Company.
1902, March 19	Alleghany Mining Company entered into receivership.
1902, May 28	Montgomery Gold Leaf Mining Company purchased the Alleghany Mining Company land at a sheriff's auction.

1903	Montgomery Gold Leaf Mining Company continued to extend its new adit and, by the end of 1903, its length was upward of 240 feet into the hill. Some work was undoubtedly done in adit 1 since a concrete pad was laid near its entrance which probably served as a location for a gasoline driven generator by which to operate the electric drills.
1904, Aug. 20	Name of Montgomery Gold Leaf Mining Company changed to Pahaquarry Mining Company.
1904	Dr. Nicholas S. Keith authorized to have his "new" concentration process installed in a mill. This process included a twenty-foot high, circular brick furnace housed in a room next to the mill. A second twenty-foot high brick tower next to the furnace acted as a scrubber tower.
1905-06	No excavation done. Prospecting located the outcrop of copper mineralization on the hill above the adits.
1906, March 6	An order was placed with the Colorado Iron Works Company of Denver, Colorado, for milling machinery that included two sets of 16-x 30-inch standard rolls, four sets of 10-x 30-inch standard rolls, and twenty-two impact screens. Around this same time, the Deshlers purchased twin Weber gas producers from the Weber Gas Engine Company of Kansas City, Missouri to supply fuel for Keith's furnace. In addition they bought a gasoline engine to be used as the power source to operate the mill, and Frue vanners for the concentration process.
1906-07	Company officials decide to develop an open-pit quarry on the hill in back of their mill site. To support this operation, they constructed a tipple near the quarry from which ran a 2,500-foot, double-track tramway to a 1,000-ton ore bin located on the hill above the mill.
1908, late	Mill completed, but the Keith process failed.
1909-10	Mill converted to accommodate a new concentration method which involved a flotation system with an ore drier. Some of Keith's equipment was replaced. The Deshlers installed an Austin gyratory crusher, a circular rotary screen, Fairbanks-Morse automatic scales, a flotation (Callow) tank, an Overstrom concentrating table, a Traylor Engg concentrating table, a Weber 3-cylinder gasoline engine that drove a 722 K.V.A. generator as the mill was now electrified, an auxiliary power plant which consisted of a Fairbanks-Morse single cylinder gasoline engine that operated a Crocker-Wheeler direct current generator to power two Gardner electric rock drills, and a compressed air system to operate the flotation tank. A concrete dam was constructed near the mouth of Mine Brook to provide water for the flotation operation. An Aldrich Triplex electric pump was installed in an adjacent, newly built, pumphouse. Water was pumped

	to a 13,000-gallon water tank that was erected on the hill above the mill.
1911	Miners dug ore for three months and the mill operated for two months. A small amount of ore shipped, but this process, too, failed. Three ingots were obtained from this ore.
1912	Mill readapted for a roasting and leaching process, but it also failed. To accommodate this system, the Deshlers purchased a Hardinge conical ball mill, a McDougall Roasting Furnace, and eight wooden leaching tanks.
1913, March 26	With the latest failure, the Pahaquarry Mining Company directors approved a 250,000 share increase in stock to raise money.
1913, Sept. 29	Pahaquarry Mining Company entered receivership.
1916, June 20	Receivers ordered to sell the Pahaquarry Mining Company property to the Delaware Valley Exploration Company with provision that the latter company pay the mortgage debt.
1917, Feb. 10	Pahaquarry Mining Company property sold to the Delaware Valley Exploration Company.
1918, July 29	Delaware Valley Exploration Company unable to pay the Pahaquarry mortgage debt and the property was ordered sold at a sheriff's auction.
1918, Nov. 2	Mining property sold to Dr. H. H. Wolford.
1920, Feb. 17	Wolford sold the property to Harry Deshler and his father Oliver. They mortgaged the property to Henry A. Berendsen and converted the lowest level of the mill into a saw mill where they manufactured railroad ties. They also built a brick building near the blacksmith shop where they manufactured barrel staves.
1922	When the Deshlers could not meet the mortgage payment, they transferred the property to Berendsen.
1925, May 20	Berendsen sold the property to the Trenton Council of the Boy Scouts of America with the provision that he be allowed to keep the mining machinery.
1928	Berendsen sold the machinery to Max Tomback, a Newark junk dealer, who removed the machinery.
Ca. 1926	The Boy Scouts remodeled part of the mill into a mess hall. The mine office building was converted into the chief ranger's home. The mine workers' dormitory was used for storage.

Ca. 1943	New mess hall constructed using part of the mine blacksmith shop foundation as its foundation.
1951	Old mine office (ranger's home) became an infirmary.
1951	Mine workers' dormitory remodeled with a one-story side addition to the ranger's home.
1955	Flood damages the old mine office (infirmary) with the result that the second floor is removed and a covered porch added to one side of the building.
1970, June	United States Army Corps of Engineers acquired the property from the Boy Scouts. The Corps of Engineers demolished the mine and Boy Scout buildings.

PAHAQUARRY MINING AND BUILDING CHRONOLOGY

MINE OPENINGS

Based upon existing evidence, this section will attempt to define the mining activity that occurred at the Pahaquarry mining site. Mining occurred in five periods: the 1750s, 1829-30, 1847-48, 1861-62, and 1901-12. The first mining probably began about 1754 after John Reading, Jr. and his partners had acquired sufficient land on which the copper ore appeared. Prospecting in the 1829-30 period probably did not get beyond collecting assay samples. Consequently, this section will focus on the periods when extraction did occur. By December 1861, Montroville Wilson Dickeson noted fourteen mining sites. Using Dickeson's numbering system, the following descriptions and mining periods are given for these areas plus two additional 1901-12 period areas and seven adits and prospect holes dating mostly from the 1750s:

Opening 1 – This adit was noted by both Henry Rogers in 1839 and John Jordan in 1840. Jordan wrote that it was fifty to 100 feet long, while Rogers observed that it was obstructed by rubbish. Consequently, the adit probably dated from the 1750s. In 1868, George Cook noted that one adit ran for about 150 feet on a southwest trend and then turned northwest. Since Opening 1 is the only adit to have a directional change, additional work at this site had to have been done in the 1847-48 period. A concrete pad near the entrance was probably placed there in the 1901-03 period as a location for a gasoline-driven compressor to power drills as the adit was once again extended. As a result, Opening 1 has been worked in the 1750s, 1847-48, and 1901-12 periods.

Opening 2 – Both Rogers and Jordan noted this adit in 1839 and 1840. Jordan reported that it was fifty to 100 feet in length, while Rogers wrote that its entrance was obstructed by rubbish. Consequently, mining probably occurred at this adit in the 1750s. Mining did not take place here in the 1847-48 period because, as Dickeson noted in 1861, he could not adequately examine it since "owing to the great length of time this drift had remained undisturbed, the sides had become so foul, from the accumulation of debris of various kinds." Evidence does not indicate that mining took place in this adit during either the 1847-48, 1861-62 or 1901-12 periods.

Opening 3 – Located above Opening 2, Dickeson found an "old" inclined shaft that extended about forty feet. Because of his characterization, one has to conclude that this shaft dated from the 1750s. No work seems to have occurred at this site in the 1847-48, 1861-62, and 1901-12 periods.

Opening 4 – Located about fifteen feet uphill from Opening 3, Dickeson described this forty-foot long inclined shaft as "undoubtedly the first opened on the property." As a result, one has to conclude that this inclined shaft dated from the 1750s. No work seems to have occurred at this site in the 1847-48, 1861-62, and 1901-12 eras.

Opening 5 – Dickeson located this shaft on the third terrace above the Delaware River. With an opening diameter of 7 x 15 feet, it had been dug to a depth of about

twenty feet in the 1847-48 period. In 1861, the south wall was partly removed to obtain a foundation area for a shed that contained a windlass frame. An ore house was also built nearby. In 1861 miners removed several tons of ore. By April 1862 the shaft had been extended to a depth of fifty-nine feet. As a result, evidence shows that this shaft was worked in the 1847-48 and 1861-62 periods.

Opening 6 – Dickeson observed that this shaft had a fifteen-foot diameter, but a depth of only a few feet. It was located southwest of Opening 5. No date has been established for this shaft although it was probably sunk and worked only in the 1847-48 period.

Opening 7 – About fifty feet beyond Opening 6, Dickeson found an open cut about 100 feet long and fifteen feet deep. Again, evidence showed no firm date for the excavation of this cut. It probably was opened in the 1847-48 period and not mined at a later date.

Opening 8 – From Opening 7 Dickeson encountered a shale arch which he characterized as an "Elephant's Back." Opening 8 penetrated the center of this geological feature. No date has been established for this excavation, but it probably occurred in the 1847-48 period.

Opening 9 – Located some twenty-five feet from the Elephant's Back, Dickeson found this shallow shaft of about five foot depth. Evidently a prospect hole, this opening was probably made in the 1847-48 period.

Opening 10 – Dickeson described this small shaft on the upper terrace as a prospect hole dug to determine the ore character at that location. Again this shaft was probably dug in the 1847-48 era.

Opening 11 – This small shaft, located 175 feet from Opening 10 constituted another prospect hole which was probably dug in the 1847-48 period.

Opening 12 – Dickeson described this adit of unspecified length as being located on the terrace below Opening 11. It ran in a southward direction and was no doubt dug in the 1847-48 period. No work seems to have occurred at this site in the 1861-62 and 1901-12 eras.

Opening 13 – Dickeson noted in 1861 that this adit had a length of about ten feet above which ran a cross-cut of about seventy-five feet. Work on this adit, which was located in the face of the sandstone outcropping, probably occurred in the 1847-48 period. No work seems to have occurred in this adit during 1861-62. Quarry work in the 1907-12 period apparently destroyed this adit.

Opening 14 – In 1861, Dickeson found an old shaft on the third terrace some 600 feet from the brow of the hill. Probably dating from 1847-48, it had a ten-foot diameter and a depth of fifteen feet. By January 1862, the shaft had been dug an additional ten feet deep. In the 1907-12 period this shaft apparently was covered by the quarry tailings pile.

New Adit – After April 1901, workmen for the Montgomery Gold Leaf Mining Company began to dig this new adit at a site below Opening 1. By the end of that year, they had removed 100 tons of low grade ore. At the end of 1903, when work seemed to have ended at this site, the adit had been extended to approximately 300 feet. In subsequent years, the entrance to the adit collapsed and it has been termed a cut.

Quarry – Although no mining occurred at Pahaquarry through most of 1905-06, prospecting continued and led to the discovery that the copper ore bed outcropped on the hill in back of Openings 1 and 2. This situation made open-pit mining easier than obtaining ore from underground sources. The company began to excavate at the quarry in 1907.

Adit On Lower Terrace – An adit with about a fifteen foot length exists in the hillside of the lower terrace about 100 yards southwest of the point where the trail to Opening 2 and the Keyser trail split. It has never been reported in any existing documents, however, it appears to be an exploratory adit from the 1901-12 period.

Prospect Holes on Upper Hillside Opposite Opening 1 – Five prospect holes are located near the top of the hillside on the opposite side of Mine Brook from Opening 1. Dickeson mentioned them in his 1862 report. They appear to be the earliest prospect holes on the property from the 1750s period.

Prospect Adit Across Mine Brook Opposite Opening 1 – A short adit with a small opening exists in the rock wall on the opposite side of Mine Brook from Opening 1. It probably dates from the 1750s, but no mention has been made of it in existing literature.

MINE BUILDING CONSTRUCTION

1750s – In 1754 Anthony Maxwell, a partner of John Reading, purchased two acres of land "a little to the northwestward" of the original forty acres on which buildings were constructed for use by those "concerned in the affair of mining." Maxwell resided in one of the buildings from perhaps 1754 to 1759. Buildings from this mining era do not exist except for perhaps archeological remains. In his 1861 report, Dickeson noted a site formerly occupied by a mill. Since a mill did not exist in the 1829-30 or 1847-48 periods, it had to have been constructed in the 1750s. Two dams on Mine Brook with a millrace also existed from that era.

1847 – A 18 x 32 foot two-story building with a third floor attic and a basement, as well as an attached 12 x 18 foot kitchen was constructed. The attic served as a company office and location to assay the copper ore. The mining superintendent undoubtedly occupied part of the structure, and probably several miners who were not local residents. A barn was probably constructed nearby to house the company livestock. Although no location was given for this structure, it probably was built on a bench near the Delaware River on the 33.75 acre tract obtained from Samuel Shoemaker on April 2, 1847. In 1861, Dickeson described the mining property as having a good dwelling house on it. Consequently, it can be assumed that the 1847

building was used during the 1861-62 mining period. It was probably the same dwelling occupied by Oliver Courtright who purchased the 33.75 acres in 1875.

1861 – A shed to house a windlass was built at inclined shaft number 5. An ore house was constructed at an unspecified location probably somewhere near inclined shaft number 5.

1904 – Aside from perhaps the powder house, the mill to house the Keith concentration process seems to be the first building on which the Pahaquarry Mining Company began construction. It was not completed with machinery until late in 1908. During the course of construction the mill was redesigned to include another story with dormers on the roof. A two-story extension was no doubt added to the mill at this time. It housed the twin Weber gas producers and later the electrical generating equipment.

1905 – Although the exact construction dates cannot be ascertained, the Pahaquarry Company had to have begun to erect its blacksmith shop with a steam-heat boiler, barn, oil house, ice house, office building with laboratory, and workers' dormitory, as well as building a new stone dam on Mine Brook, in the 1905-06 period.

1906-07 – With the development of the quarry, the company added the 1,000 ton ore storage bin on the hill above the mill and constructed the track from the quarry to a nearby tipple from which ore was transported to the storage bin by way of a double-track gravity tramway.

1909 – The mill was remodeled in the 1909-10 period to accommodate a new flotation system and ore dryer for the concentration process.

1909 – At this time, the company constructed a pump house on the left bank of Mine Brook near the Delaware River to improve its water supply since the stone dam farther upstream on Mine Brook failed to provide adequate water during dry periods. In addition it built a concrete dam and reservoir on Mine Brook near the pump house. Water was pumped from this reservoir and the Delaware River to a 13,000 gallon tank built on the hill above the mill.

1912 – With the failure of the flotation system, the company adapted the mill for another concentration process with equipment for roasting and leaching the low grade ore.

1920 – When Harry and Oliver Deshler purchased the land, they erected a brick building behind the blacksmith shop in which they produced barrel staves.

1925 – Property sold by Henry A. Berendsen to the Trenton Council of the Boy Scouts of America. Berendsen kept the right to dispose of the mining machinery and, by 1928, he sold the machinery to a Newark junk dealer.

Ca. 1926 – The Boy Scouts remodeled part of the mill into a mess hall. The company office building was remodeled into the chief ranger's residence. The mine

workers' dormitory became a storage facility for the Boy Scouts. The Boy Scouts occupy the Courtright house and use it as a craft shop.

Ca. 1943 – A new mess hall was constructed and the foundation of the old mining blacksmith shop served as part of the mess hall foundation. About this time the old mining mill was razed leaving only some stone walls.

1951 – The mine workers' dormitory was remodeled with a one-story side addition into the chief ranger's home. The mining company office building became a Boy Scout infirmary.

1955 – The mining company office building (Boy Scout infirmary) was damaged in a flood with the result that the second floor was removed and a porch added to the building. About this date, the old mining oil house was expanded in size and used for a trading post. The remaining stone walls from the mill were covered with wood framing to serve as a winter quarters for the Boy Scouts.

During its occupation of the site the Boy Scouts constructed tent platforms and latrines adjacent to the site of the mining affiliated buildings. They also erected buildings on either side of Mine Brook near the Delaware River for staff housing, latrines, craft shop, nature study, and storage. The Boy Scouts also installed a dock, parade field, baseball diamond, archery field, and a personal fitness site in that area.

1970 – The United States Army Corps of Engineers acquired the property and soon thereafter removed all of the buildings.

Remainder of Appendixes printed in Volume 2

As the nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering wise use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The department assesses our energy and mineral resources and works to ensure that their development is in the best interests of all our people. The department also promotes the goals of the Take Pride in America campaign by encouraging stewardship and citizen responsibility for the public lands and promoting citizen participation in their care. The department also has a major responsibility for American Indian reservation communities and for people who live in island territories under U.S. administration.

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